VICTORY BONDS ARE BUSINESS BONDS

THE HEATING AND VENTILATING MAGAZINE

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Vol. XVI. No. 4
$2.00 a year. 20 cents a copy

APRIL, 1919

Engineering Library

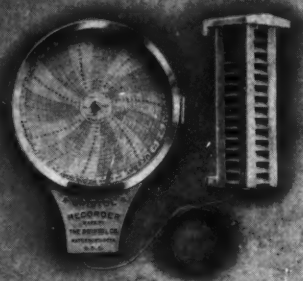
GENERAL LIBRARY
APR 17 1919

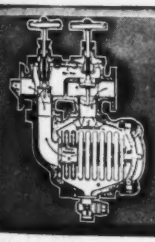
Published at Cooperstown, N. Y.
New York Office, 1123 Broadway

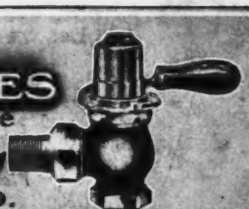
GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 11 E. 42ND ST. 188-200 FRANKLIN ST. BOSTON.

MASON REDUCING VALVES
and other PRESSURE REGULATORS
for all conditions of service
MASON REGULATOR CO., 15 Medway St. Boston Mass.
TRADE MARK MASON

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875
PRESSURE REGULATORS, BACK PRESSURE VALVES, EXHAUST RELIEF VALVES, STOP AND CHECK VALVES, FLOAT VALVES, BALANCED VALVES, STEAM TRAPS AND OTHER VALVE SPECIALTIES FOR HEATING PLANTS
SEND FOR LATEST CATALOG
G. M. DAVIS REGULATOR CO.
436 MILWAUKEE AVE., CHICAGO

ATMOSPHERIC TEMPERATURES
Accurately Recorded
Continuous records of outdoor temperatures guide the operation of heating and ventilating systems. The sensitive bulb of a
BRISTOL'S
REG. U.S. PAT. OFFICE
RECORDING THERMOMETER
Enclosed in a lattice box is installed out-of-doors and the recording instrument inside where it is readily referred to.

Write for Bulletin 7204
THE BRISTOL COMPANY Waterbury Conn.


ROSS
FEED-WATER FILTERS
Will Keep Oil Out of Your Boiler
Regulating Valves for Water, Steam, Air
Ross Valve Mfg. Co. Troy, N. Y.
Ask for List of Users

PACKLESS RADIATOR VALVES
Insures Satisfaction Every System
A Valve for
Write for Catalogue and Discounts
208 NORTH FIFTH AVENUE CHICAGO.


Entered as second-class Matter at the Post-Office in Cooperstown, N. Y. Copyright 1919 by Heating and Ventilating Magazine Co.

CLARAGE
KALAMAZOO

MULTIBLADE FANS

For Heating and Ventilating Factories and Public Buildings this unit, Clarage Multiblade Fan driven by Clarage Type "V" Low Pressure Engine, is very desirable.

The Clarage Multiblade Fan is exceedingly efficient. The peculiar construction of the wheel of our Fan enables you to secure the necessary results with a considerable Saving of Power. This Fan is equipped with Special Dust-proof, Oil-tight, Self-oiling Bearings.

The Type "V" Low Pressure Engine for motive power is also a big saving over motor drive. It is possible to use the exhaust steam from the pipe coils or vento, (otherwise a waste) for operating this engine.

Our Engineering Department is skilled in the planning of successful Heating and Ventilating Systems. They would be glad to extend the Service to you, gratis. Write now for more information.

New York
Boston

CLARAGE FAN COMPANY.
HEATING, VENTILATING & DRYING ENGINEERS.
KALAMAZOO—MICHIGAN—U. S. A.

Chicago
Cleveland

THE HEATING AND VENTILATING MAGAZINE

APRIL, 1919

SIMPLIFYING CALCULATIONS FOR FLOW OF STEAM IN PIPES

Curves Based on Accepted Formulae for Quick and Easy Reference.

For a subject as common as the flow of steam in pipes little discussion would seem to be warranted, for it is a problem with which engineers have had to deal ever since they have applied steam to useful purposes. Yet the experiments covering such work are not by any means as numerous and exact as might be desired nor are the results obtained as accurate as might be expected. It has been the aim of the writer in the following discussion to select the most generally accepted formulae evolved for such computations and to develop therefrom curves covering all conditions by means of one reading of the curves and not to exceed one simple arithmetical operation in order to reduce the quantity obtained from the curves so as to suit any other condition, if such change be desired. No effort has been made to produce a new set of results, giving rise to further confusion, but, on the contrary, to place the results already obtained in a form suitable for ready reference and practical application, thus aiding the reader in arriving quickly at a positive and reasonably accurate result.

It must be realized that the flow of steam—or any other gas or liquid—in pipes is, to a large extent, dependent on the condition of the interior of the pipe; wrought-iron pipe will have a greater pressure drop than steel pipe, and unreamed pipe a greater drop than thoroughly reamed pipe; fittings and valves also retard the flow. At best, after allowance is made for all calculable losses a liberal factor of safety is recommended, besides which the condensation of the line itself must be computed and deducted from the final discharge in order to obtain the net delivery.

It is probable that the most generally accepted formulae for the flow of steam in pipes consists of

$$W = 87\sqrt{\frac{w(p_1 - p_2)d^5}{L\left(1 + \frac{3.6}{d}\right)}} \quad \text{or} \quad p_1 - p_2 = 0.000132\left(1 + \frac{3.6}{d}\right)\frac{W^2 L}{wd^5}$$

when

W = weight of steam in pounds per minute.

L = length of pipe in feet.

d = diameter of pipe in inches.

w = mean density of steam in pounds per cubic foot at initial and final pressures.

$p_1 - p_2$ = drop — i. e., initial pressure—final pressure, both in pounds per square inch absolute.

Calculation by the first formula will develop the quantity of steam in pounds per minute with an assumed drop and

size of pipe while the second formula gives the drop in pressure for an assumed quantity and size of pipe. For convenience L is most often taken as 240 diameters of pipe or (better for tabular use) as 100-lin. ft. of pipe.

In the transactions of the A. S. M. E. Vol. XX, p. 354 two tables computed by E. C. Sickles are given, these tables being based on a formula practically the same as formula (1) except that the constant 87 is changed to 87.45. These tables are as follows:

If 125 lbs. gage or 140 lbs. absolute is taken as an average high pressure and a 100-ft. run as the basis of length the curves shown in Fig. 1 may be plotted for each size of pipe at various drops and 0 to 10 lbs. per 1000 ft. have been selected as covering all ordinary cases. It can be seen by the formulae, however, that the drop is inversely proportional to the density—all other factors being the same—and that the delivery is directly proportional to the square root of the densities. From

TABLE NO I

LINE NO.	NOMINAL SIZE OF PIPE																		
	24"	22"	20"	18"	16"	15"	14"	13"	12"	10"	8"	6"	5"	4"	3½"	3"	2½"	2"	1½"	1"
1	14,000	11,188	8,777	6,678	4,953	4,163	3,481	2,896	2,378	1,443	799	371	227	133	74.6	48.9	28.8	18.1	6.81	2.35
2	13,000	10,392	8,149	6,203	4,578	3,867	3,233	2,689	2,209	1 341	742	344	210	1146	69.2	45.9	27.6	16.8	6.45	2.24
3	12,000	9,592	7,517	5,724	4,222	3,569	2,983	2,481	2,039	1,237	685	318	194	106.0	65.6	42.9	26.4	15.5	6.09	2.16
4	11,000	8,794	6,891	5,247	3,868	3,271	2,736	2,275	1870	1.134	628	292	178	97.0	62.7	43.9	25.2	14.2	5.95	1.98
5	10,000	7,992	6,265	4,770	3,517	2,974	2,486	2,068	1,662	1,031	571	265	162	88.2	59.7	39.9	24.0	13.9	5.67	1.80
6	9,500	7,705	5,967	4,582	3,341	2,825	2,362	1,940	1,570	979	542	247	1678	83.8	56.8	37.9	22.8	13.3	5.29	1.71
7	9,000	7,205	5,638	4,393	3,165	2,676	2,239	1,846	1,497	928	514	239	146	79.4	53.8	35.9	21.6	11.6	5.00	1.62
8	8,500	6,905	5,324	4,069	2,989	2,527	2,118	1,743	1,414	876	486	226	138	75.0	50.8	33.9	20.4	10.9	4.73	1.53
9	8,000	6,606	5,012	3,816	2,814	2,379	1,989	1,640	1331	825	457	212	130	70.6	47.6	31.9	19.2	10.3	4.63	1.44
10	7,500	6,106	4,695	3,577	2,638	2,230	1,865	1,538	1,248	773	428	199	122	66.2	44.6	29.9	18.0	9.68	4.15	1.30
11	7,000	5,707	4,385	3,339	2,462	2,082	1,740	1,435	1,164	722	400	186	113	61.7	41.6	27.9	16.8	9.03	3.81	1.24
12	6,500	5,307	4,069	3,100	2,286	1,933	1,616	1,333	1,081	670	371	172	105	57.3	38.6	25.9	15.6	8.38	3.69	1.17
13	6,000	4,905	3,758	2,862	2,110	1,784	1,492	1,230	998	619	343	159	97.2	52.9	35.6	23.9	14.4	7.74	3.44	1.08
14	5500	4,503	3,448	2,623	1929	1635	1,368	1,128	915	567	314	146	89.1	48.5	32.6	21.9	13.2	7.10	3.11	0.99
15	5000	4,103	3,137	2,385	1,757	1,487	1,243	1025	832	516	286	132	81.0	44.1	29.6	20.0	12.0	6.46	2.88	0.91

Note. Pounds of Steam Delivered per Minute for Drops given in Same Line of Table II

STEAM FLOW TABLE FOR VARIOUS-SIZED PIPES.

TABLE II

LINE NO.	Steam Pressure (Lbs. Absolute)									
	90	100	120	130	140	150	180	200	220	250
	LBS. DROP PER 1000 FT. STRAIGHT PIPE									
1	18.1	16.4	13.8	12.8	11.9	11.1	9.39	8.50	7.76	6.87
2	15.6	14.1	11.9	11.0	10.3	9.60	8.09	7.33	6.69	5.92
3	13.3	12.0	10.1	9.38	8.75	8.18	6.90	6.24	5.70	5.05
4	11.1	10.0	8.4	7.83	7.31	6.83	5.76	5.21	4.76	4.21
5	9.25	8.36	7.5	6.52	6.09	5.69	4.80	4.34	3.97	3.51
6	8.33	7.53	6.35	5.87	5.48	5.13	4.32	3.91	3.57	3.16
7	7.41	6.76	5.70	5.27	4.92	4.60	3.88	3.51	3.21	2.84
8	6.67	6.03	5.08	4.70	4.39	4.10	3.46	3.13	2.86	2.53
9	5.91	5.35	4.50	4.17	3.89	3.64	3.07	2.78	2.53	2.24
10	5.19	4.69	3.95	3.66	3.42	3.19	2.69	2.44	2.23	1.97
11	4.52	4.09	3.44	3 19	2.98	2.78	2.34	2.12	1.94	1.72
12	3 90	3.53	2.97	2.75	2.57	2.40	2.02	1.83	1.67	1.48
13	3.32	3.00	2.53	2.34	2.19	2.04	1.72	1.56	1.42	1.26
14	2.79	2.52	2.13	1.97	1.84	1.72	1.45	1.31	1.20	1.06
15	2.31	2.09	1.76	1.63	1.52	1.42	1.20	1.08	0.99	0.88

Note. The above drops correspond to the discharges given in same line of Table I.

PRESSURE DROP TABLE TO BE USED WITH TABLE 1.

this relationship the following factors are derived for changing either the quantity or drop shown by the curves for 140 lbs. absolute pressure to any other absolute pressure. The factors for Fig. 1 are shown in Table III.

Thus, an 18-in. pipe which, by the curves, delivers 5100 lbs. of steam per minutes at 140 lbs. absolute pressure with 7-lb. drop, will deliver, at 90 lbs. absolute, 0.81 of 5100 lbs. or 4131 lbs. with the same drop or would deliver 5100 lbs. with 1.52 x 7 lbs. = 10.64 lbs. drop. At 250 lbs. absolute pressure it will deliver 5100 x 1.33 = 6783 lbs. per minute with the same loss in pressure (7 lbs.) or will deliver 5100 lbs. with 7 x 0.57 = 3.99 lbs. drop in pressure.

To make the curves for smaller pipe more accurate the bottom portion of the diagram between zero and 50 lbs

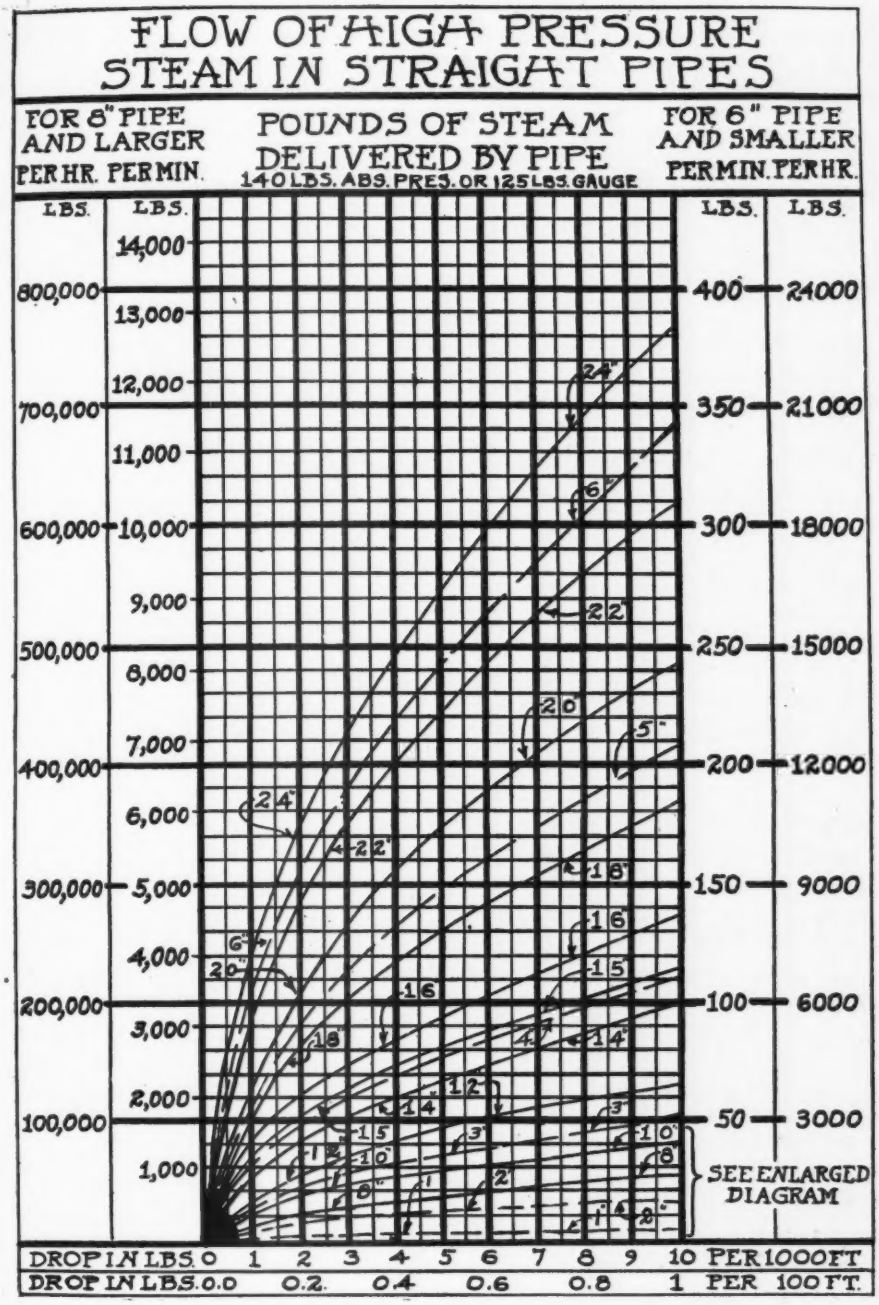


FIG. 1—FLOW OF HIGH-PRESSURE STEAM IN STRAIGHT PIPES.

per minute has been enlarged and is shown in Fig. 2; this allows closer readings on pipes up to 3-in. in size while above this Fig. 1 is sufficiently accurate.

TABLE III

Absolute Pressure in Pounds per Sq. In.	Multiply Delivery by	or Multiply Drop by
250	1.33	0.57
220	1.24	0.65
200	1.19	0.71
180	1.13	0.79
150	1.03	0.94
140	1.00	1.00
130	0.97	1.07
120	0.93	1.16
100	0.85	1.38
90	0.81	1.52
80	0.77	1.70
70	0.72	1.93
60	0.67	2.22
50	0.62	2.65
40	0.56	3.26
30	0.48	4.27
20	0.40	6.23

For steam at low pressure, say 30 lbs. absolute or less, the table prepared by Professor William Kent and presented before the A. S. H. & V. E. in 1907 may be taken as the most generally accepted means of determining the delivery and drop on such lines. This table is shown in Table IV and from this the curves shown in Fig. 3 have been plotted.

Kent's table is based on a modification of D'Arcy's formula for the flow of water which was made as follows for steam:

when

$$W = C \sqrt{\frac{w (p_1 - p_2) d}{L}}$$

W = the weight of steam delivered in pounds per minute.

w = the mean density of steam in pounds per cubic foot for the initial and final pressures.

p_1 = the initial pressure in pounds per square inch.

p_2 = the final pressure in pounds per square inch.

L = the length of the pipe in feet.

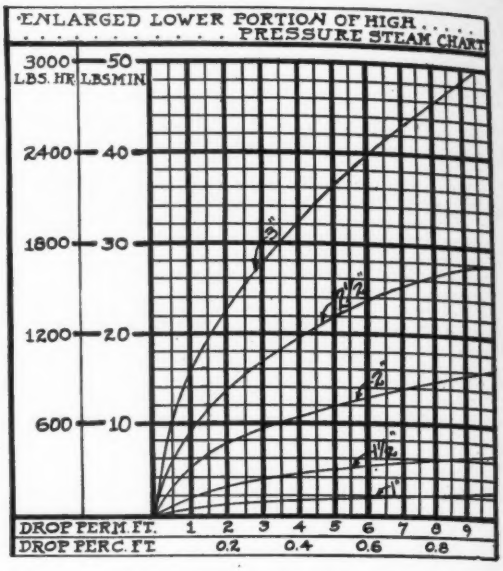


FIG. 2—ENLARGED LOWER PORTION OF FIG. 1

C = a constant varying from 36.8 for ½-in. pipe up to 63.2 for 24-in. pipe.

It will be seen that in plotting the curves some pressure had to be assumed as a basis and for this about 20 lbs. absolute or 5.3 lbs. gage was adopted as this is the most commonly used low pressure. For any other pressure or drop in Fig. 3 the factors are as follows:

TABLE IV

Nominal Pipe Size	Initial Steam Pressure (Lbs Gage)								
	0 3	1 3	2 3	3 3	4 3	5 3	6 3	8 3	10 3
	Flow of Steam (Pounds per Hr)								
½	4.2	4.3	4.4	4.6	4.7	4.8	4.9	5.1	5.3
¾	9.7	10.0	10.3	10.5	10.8	11.0	11.0	11.8	12.3
1	19.0	19.6	20.2	20.7	21.2	21.7	21.7	22.2	24.2
1¼	40.1	41.3	42.5	43.7	44.8	45.9	45.9	46.1	50.9
1½	61.4	63.2	65.1	66.8	68.6	70.3	71.9	73.1	78.1
2	120.8	124.5	128.2	131.6	135.0	138.3	141.5	143.7	153.6
2½	195.7	201.8	207.5	213.2	218.7	224.1	229.2	233.2	248.1
3	345.5	356.1	366.5	376.4	386.1	395.5	404.7	412.4	439.4
3½	505.3	521.1	536.9	551.8	566.7	581.5	591.1	603.2	642.6
4	701.4	722.0	744.0	764.4	784.2	802.4	822.1	837.4	891.6
4½	931.7	967.6	995.8	1023	1049	1075	1100	1141	1193
5	1262	1291	1328	1364	1399	1433	1467	1531	1592
6	2011	2074	2134	2192	2248	2303	2356	2459	2557
7	2936	3027	3115	3199	3281	3361	3440	3590	3733
8	4082	4208	4331	4448	4564	4674	4783	4991	5191
9	5462	5630	5794	5951	6107	6254	6398	6673	6942
10	7014	7236	7448	7648	7846	8036	8216	8574	8914
12	11550	11916	12264	12594	12918	13236	13536	14126	14700

STEAM DELIVERY AND PRESSURE DROP WITH LOW-PRESSURE STEAM.

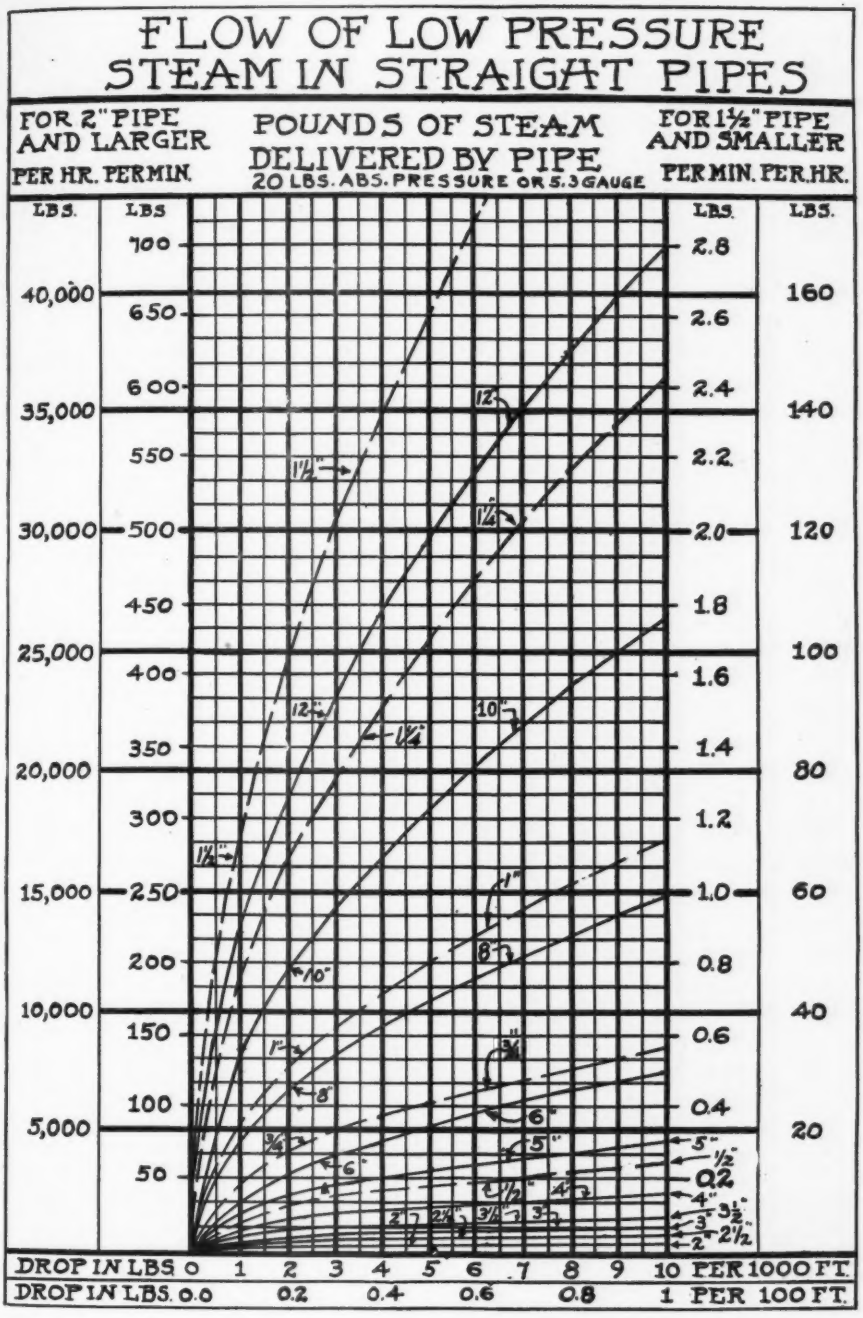


FIG. 3—FLOW OF LOW PRESSURE STEAM IN STRAIGHT PIPES, ACCORDING TO KENT.

TABLE V.

Steam Pressure in Pounds Absolute	Multiply Delivery by	or Multiply Drop by
30	1.21	.68
20	1.00	1.00
15	.87	1.31
10	.72	1.91
5	.52	3.65
4	.47	4.52
3	.41	5.90
2	.34	8.07
1	.25	16.56

Thus, for the curves it can be seen that a 10-in. pipe at 5.3 lbs. gage (20 lbs. absolute) and 0.6 lbs. drop per 100 ft. will deliver 333 lbs. of steam per minute while at 1 lb. absolute pressure it will deliver 333 x 0.25 or 83 lbs. with the same drop or 333 lbs. with 0.6 x 16.56 = 9.9 lbs. drop per hundred feet. This may also be checked from Fig. 1 by using factors for low pressure which are extension of Table III these being shown in Table VI

TABLE VI.

Steam Pressure in Pounds Absolute	Multiply Delivery by	or Multiply Drop by
30	0.48	4.27
20	.40	6.23
15	.35	8.20
10	.29	11.92
5	.21	22.80
4	.19	28.20
3	.16	36.80
2	.14	53.80
1	.10	103.30

From this it is possible to check the two sets of curves. Looking at Fig. 1 it is seen that a 10-in, pipe will deliver about 60,000 lbs. of steam per hour with 0.6 lbs. drop per 100 ft. According to the factors in Table VI this would be 60,000 x 0.40 = 24,000 lbs. at 20 lbs. absolute or 24,000/60 = 400 lbs. per minute against 333 obtained by using Fig. 2, while at 1 lb. absolute the quantity would be
60,000 lbs. x .10 = 6000 lbs. per hour or
6,000 ÷ 60 = 100 lbs. per min, against
83 lbs. obtained by using Fig. 2.

Owing to the variation of flow obtained by formulae and to the variation of flow likely to be found in actual practice due to differences in the quality of pipe, its interior surface, reaming, etc., it is recommended that these theoretical capacities be used with great conservatism and that a reasonable margin of safety be allowed.

While in long runs straight pipe usually covers the larger percentage of the friction losses, other factors also enter into the proposition to further cut down the delivery and the principal factor so entering is usually the matter of fittings, valves, etc. To allow for such loss of pressure sometimes a rough and arbitrary percentage is added to the length of the line—usually 10% for fairly straight runs up to 25% for runs with numerous offsets. Greater refinements can be obatined if each fitting and valve is counted and its resistance added by estimating how many feet of straight pipe would have an equal resistance and adding this equivalent length to that of the run. There is also a loss of energy encountered where the steam enters the pipe, this consisting of the pressure necessary to produce the velocity attained at the entrance and the pressure loss due to entering the pipe opening. This loss is usually considered as about the same as that obtained with a globe valve.

The other large factor which must be considered is that of condensation. This depends on whether the pipe is bare or covered, the fact as to its being wet or dry and to the type and efficiency of the covering employed on the line.

Experiments made on bare black iron pipe show that the radiation in B. T. U. per hour per square foot of surface per degree temperature difference remains practically a constant whether the pipe contains low-pressure steam, high-pressure steam or even superheated steam and that this constant is 3. With this as a basis the loss in B. T. U. per lineal fooot for any size of pipe is
3F (T—t) x (1—E) when (4)

TABLE VII

Equivalent *Length in Feet* of Straight Pipe to Equal Friction Losses as Noted in Left-Hand Column.

Gate Valve Cause of Loss	SIZE OF PIPE AND FITTINGS. Inches Diameter														
	1	1½	2	2½	3	3½	4	5	6	8	10	12	15	18	20
	2	4	7	10	13	16	20	28	36	53	70	88	115	143	162
Entrance	2	3	5	7	9	11	13	18	24	35	47	59	77	95	108
Ell	1	2	4	5	7	8	10	14	18	27	35	44	58	72	81
Tee on Branch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tee on Run	2	4	7	10	13	16	20	28	36	53	70	88	115	143	162
Globe Valve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F = The factor for changing lin. ft. of pipe to sq. ft. of surface.

T = the average temperature of the steam.

t = the average temperature of air surrounding the pipe.

E = the efficiency of the covering (zero for uncovered pipe).

If a pound of steam is considered as liberating 1000 B. T. U. when condensed (which is approximately correct at 50 lbs. gauge) then the pounds of steam condensed per foot for any particular size pipe is covered by the formula

$$\frac{.3F\,(T-t) \times (1-E)}{1000} \qquad (5)$$

and for 100 lin. ft. the formula becomes

$$0.3F\,(T-t) \times (1-E) \qquad (6)$$

For instance, suppose it is desired to deliver 100 lbs. of steam per minute at 60 lbs. gage or 75 lbs. absolute initial pressure at a distance of 1900 ft. through a pipe line which will be covered with a pipe covering of 80% efficiency and that the drop must not exceed 5 lbs; there will be, say, 4 elbows in the line.

Knowing the ells will increase the equivalent length of run slightly it may be assumed this will finally approximate 2000 ft. and the total pressure drop of 5 lbs. will then become 5/2 or 2½ lbs. per 1000 ft. As the average pressure is (75+70)÷2 or 72½ lbs., instead of 140 lbs. as plotted in Fig. 1, the quantity must be first reduced to its equivalent at 140 lbs. pressure. From Table III it is seen that the delivery at 72½ lbs. will be only about 73% of what it would be at 140 lbs. or 100/0.73 = 137 lbs. per minute at 140 lbs. absolute pressure. Then reading off of Fig. I over 2½ lbs. drop and opposite 137 lbs. per minute delivered it is found that a 6-in. pipe is required.

According to Table VII

One 6-in. ell = 24 ft. of straight pipe and

four 6-in. ells = 96 lin. ft. of 6-in. pipe.

1900 lin. ft. of run + 96 lin. ft. = 1996 equivalent length or approximately 2000 ft., as assumed.

But the covering has only 80% efficiency so that the condensation in pounds of steam per 100 ft. by formula (6) is

0.3 F (305 — 100) x (1—.80)

0.3 x 1.73 x 205 x 0.20 or

21.23 lbs. per 100 ft., say 2¼.

21¼ x 19 = 404 lbs. for 1900 ft.

404 lbs. ÷ 60 = 6.8 min. loss.

Reading again directly from Fig. 1 for 6-in. pipe it is seen that at 2½ lbs. drop per 1000 ft. this size of pipe will deliver 175 lbs. of 140-lb. steam per minute and 175 x 0.73 (factor for 72½ lb. steam) gives 128 lbs. of 75-lb. steam delivered. 128 lbs.—6.8 lbs. condensed in line gives 121.2 lbs. net delivered or a reasonably safe margin over the 100 lbs. actually required.

Suppose the same problem involved the use of low-pressure steam, say at 18 lbs. absolute, to be delivered with 2 lb. loss or with a pressure of 16 lbs. absolute (1 lb. gage) at the other end of the line. Again assuming an equivalent length of 2000 ft. the drop becomes 2/2 or 1 lb. drop per 1000 ft.

The average pressure (absolute) is (18 + 16) ÷ 2 = 17 lbs. absolute. From Table V it is seen that the delivery will be about 94% of what it would be at 20 lbs. absolute so that the 20-lb. equivalent is 100/0.92 = 108 lbs. per minute. Reading from Fig. 3 it is seen that this requires a 10-in. pipe. From Table VII four 10-in. ells = 4 x 47 = 188 lin. ft. and 1900+188 = 2088 lin. ft. equivalent length of run. The condensation loss for 100 ft. is (formula 6)

0.3 x 2.81 x (219—100) x (1—0.80) 0.843 x 119 x 0.20 or

20.0 lbs. per 100 ft.

20 x 19 = 380 lbs. for 1900 lin. ft.

380/60 = 6.3 lbs. per minute loss for condensation.

Reading directly from Fig. 3 for the maximum delivery of a 10-in. pipe at the loss of 2 lbs./2.088 or 0.95 lbs. per 1000 ft. shows about 125 lbs. delivered at 20 lbs. absolute or

125 x 0.94 = 117.5 lbs. at 17 lbs. absolute

117.5—6.3 lbs. condensation = 11.2 lbs. net delivery or a reasonably safe margin of 11% over the 100 lbs. per minute required.

DESIGNING DATA AS APPLIED TO A LARGE HOT WATER HEATING PLANT

Western Practice Illustrated in the Layout for the Franklin High School, Portland, Oregon.

BY GEORGE E. REED,

Mechanical Engineer in Charge.

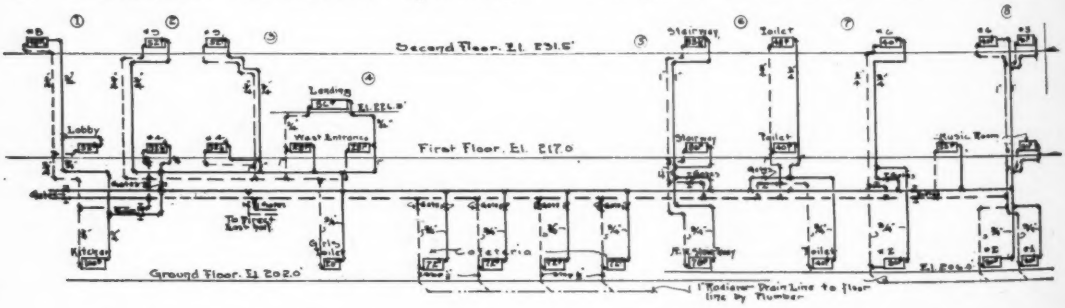
(Concluded from March Issue.)

The auditorium was designed with a separate unit for the assembly hall proper and a unit for the caféteria and class rooms. The assembly hall was provided with mushroom ventilators and was designed for upward or downward ventilation by means of air controlled reversing dampers.

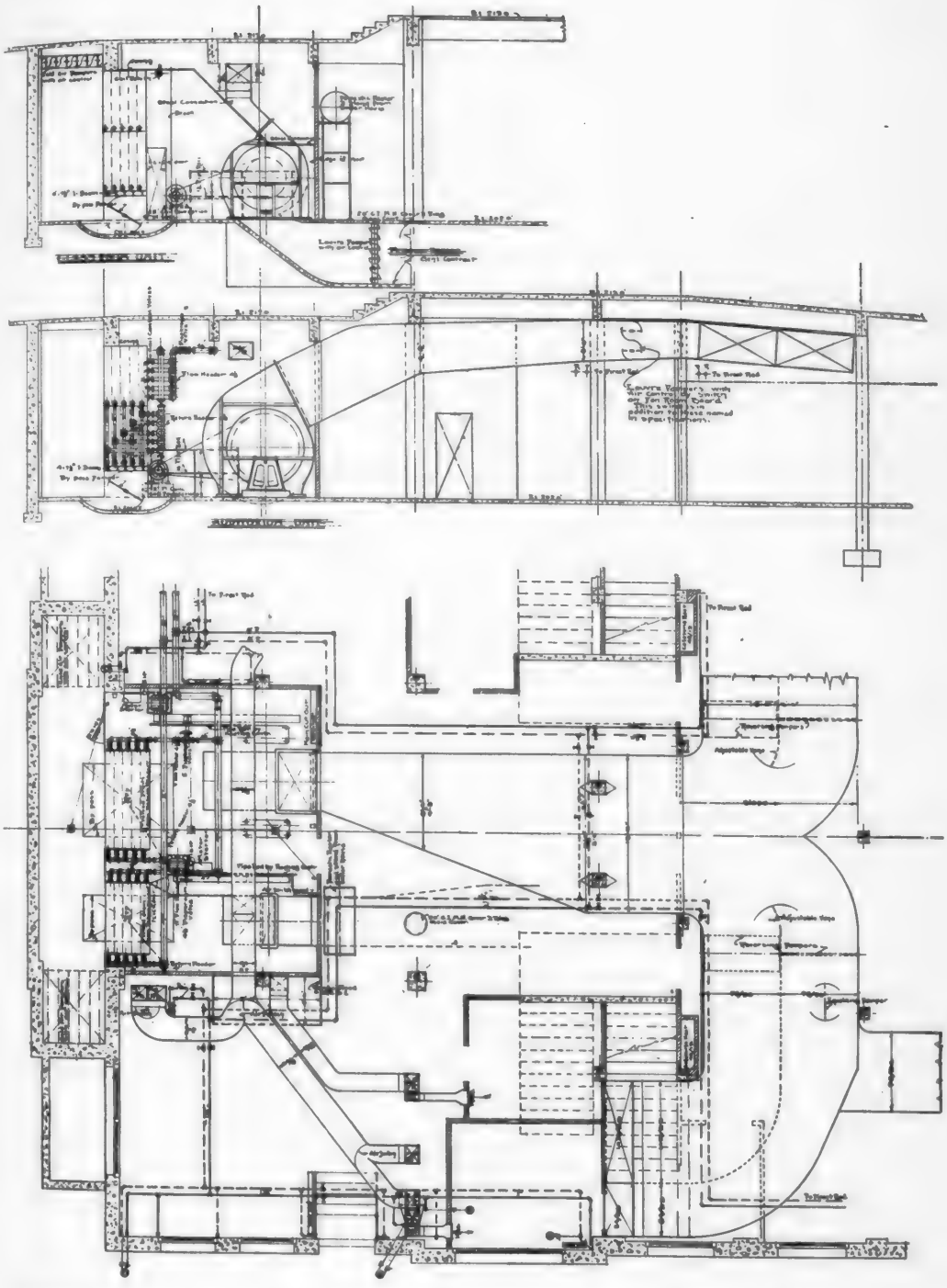
Johnson temperature regulation was installed throughout and consists of the usual thermostats, mixing dampers, etc. The coil banks are controlled by means of intermediate thermostats operating diaphragm valves in the flow lines. It has been found that these thermostats have very little to do as the rough regulation is accomplished in the plant by adjusting the temperature of the water to the weather conditions and the room thermostats do the rest.

The weather temperature under maximum weather conditions is 195° flow and 165° return, but is varied down to 115° flow temperature in mild weather.

The plant as a whole has been the



FRANKLIN HIGH SCHOOL AUDITORIUM.—DIRECT RADIATOR RISER DIAGRAM.



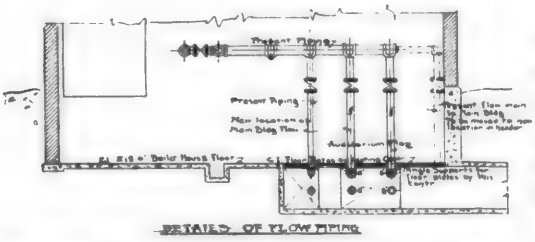
FRANKLIN HIGH SCHOOL, AUDITORIUM.—AUDITORIUM AND CLASS-ROOM FAN UNITS.

most satisfactory of any which has been thus far erected by this district. The heat is very agreeable, it is easy to control and from a ventilating standpoint it is highly satisfactory. The writer does not attempt to explain, but states as a fact that the buildings lack that so-called "stuffiness" so often present in steam-heated buildings.

The plant is very economical in fuel, and in cost of construction did not exceed the cost of a first-class vacuum heating plant. The troubles due to leaking traps are conspicuous by their absence, and the temperature of the radiating surfaces can be kept at any point down to room temperature.

WHY FORCED HOT WATER WAS SELECTED.

When the plant was designed, forced hot water was selected as the heating medium for the following major reasons:

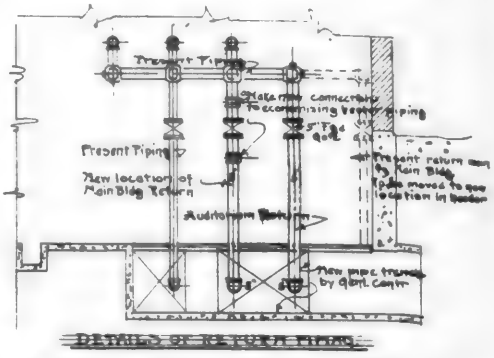


FRANKLIN HIGH SCHOOL.—FLOW CONNECTIONS FOR THIRD UNIT.

Owing to the fact that the buildings are scattered, some at a considerable distance from the plant, the mains would have to be larger to avoid excessive pressure drops.

All the fan rooms are located below the boiler house level and drainage from the various systems could not be obtained by gravity to vacuum pumps located in the plant. Were each building to be provided with an independent pump and the returns forced back, it would mean uncertain attention in lubrication, etc., and should any pump or pumps go wrong, the hot return water would have to be sent to the sewer until repairs could be made, resulting in considerable loss in water and heat.

Although heaters and circulating pumps have to be installed in a hot water system, this is offset by the fact that all complicated coil control, blast and radiator traps, diaphragm valves (with one or two exceptions) and other specialties are omitted, and vacuum pumps would have to be installed with a vacuum plant.



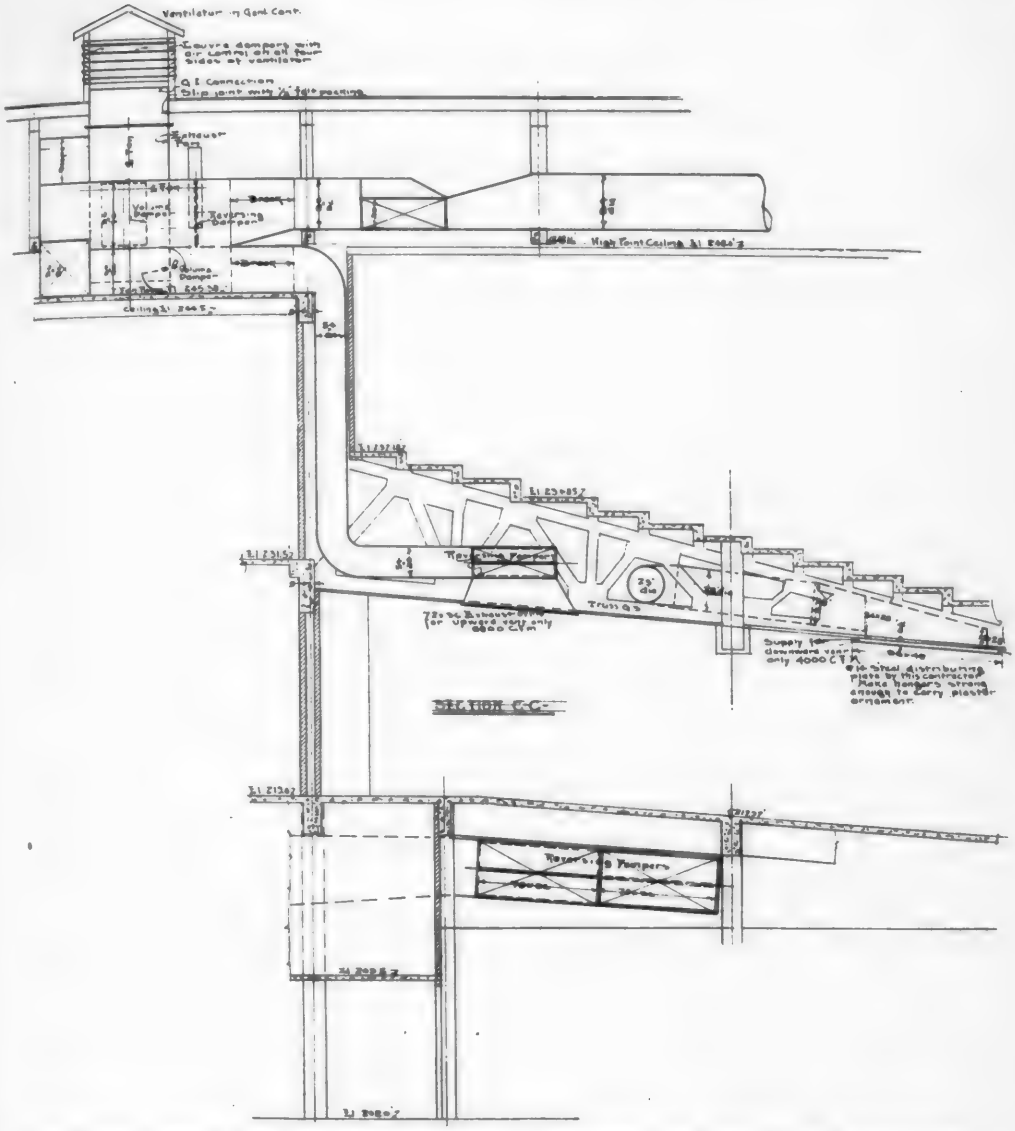
FRANKLIN HIGH SCHOOL.—RETURN CONNECTIONS FOR THIRD UNIT.

The radiation losses are very much reduced in a hot water installation since the temperature in moderate weather need not be above 125° while, with steam, the temperature will never be below 212° and will probably be higher.

All the steam apparatus is concentrated in one plant, the connections are short, and all the various losses due to leaking traps, drips and drains and leaking valves are pretty generally eliminated.

The boilers are operated on high pressure for several reasons; it is necessary for the operation of the burners; the increased heat transmission in the main heaters due to high steam temperatures permits the use of smaller heaters; while the pressure ejects the water of condensation from the traps and discharges it into the receiving tank, obviating the necessity of pumps for this purpose.

The over-all efficiency of the plant run at high pressure is probably greater than if run at low. At high pressure the furnace temperatures are higher and the combustion better than



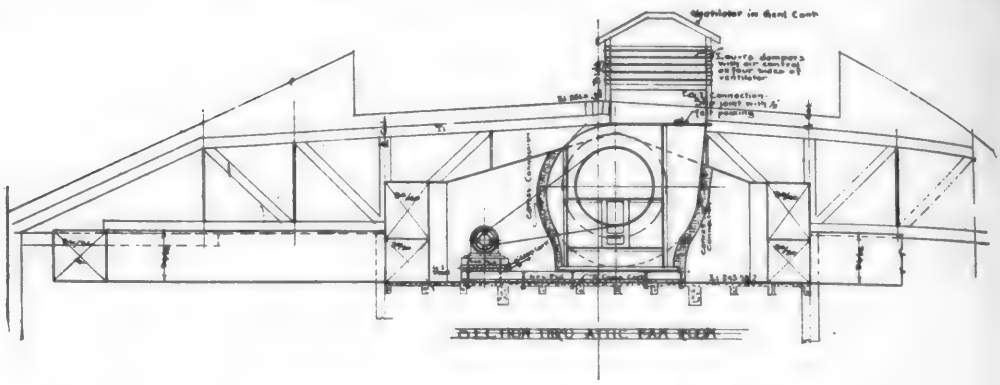
FRANKLIN HIGH SCHOOL AUDITORIUM.—ELEVATION OF SUPPLY AND EXHAUST SYSTEM.

at low. With low pressures and low temperatures the fire surfaces do not keep as clean and, while the theoretical heat transmission is greater, the actual transmission is probably less.

Future buildings will need steam for cooking, heating pool water, etc. With the present plant a small high-pressure line can be run to the building as wanted and the pressure utilized to force the returns back to the plant.

There can be no loss in expanding high-pressure steam into the heaters, as at light loads. The total heat will be the same if no work is done and the expanded steam will be more or less superheated.

Fan engines and steam-driven circulating pumps were rejected partly on account of first cost, but primarily to avoid any possibility of lubricating oil entering the boilers. All the plants in this district which have engine-driven fans are also provided with oil filters in the feed lines, but the results are far from what should be expected.



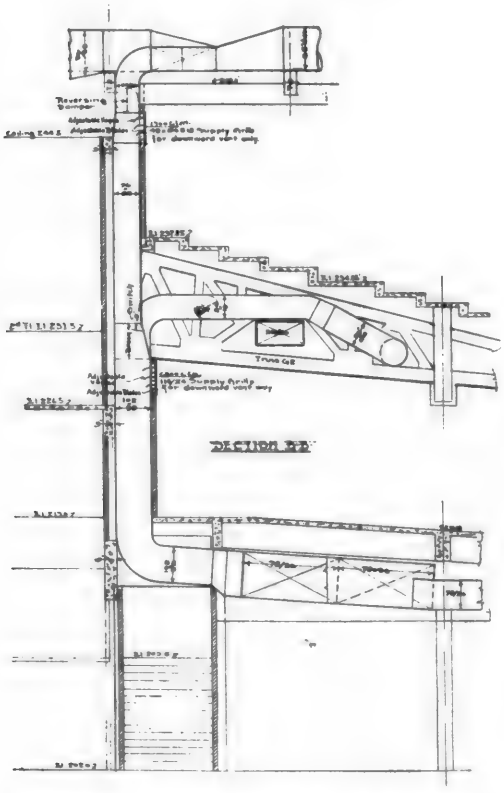
ELEVATION AUDITORIUM EXHAUST FAN.

Reliance is now no longer placed on these filters but on steel hot-wells filled with excelsior, which have been found much more satisfactory and are cheap to install.

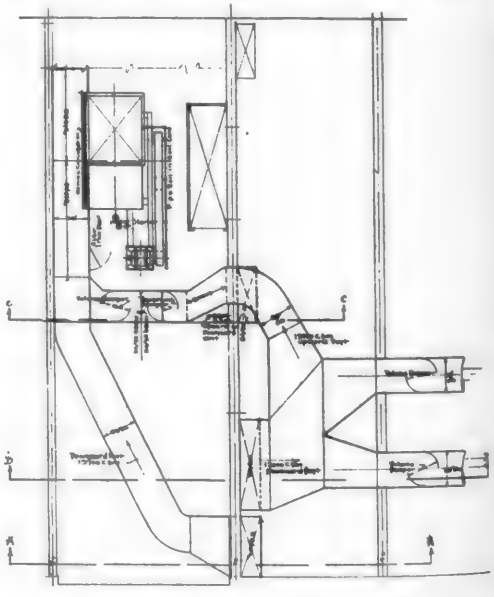
When power can be brought at the rate prevailing in this locality (1⅛ c. per K. W. H.) fan engines are expensive, especially after charging off interest, depreciation, oil and waste, extra attendance, etc. Further, to avoid wasting exhaust steam from fan engines when ventilation is required and but little or no heat is needed, standby motors would have been necessary.

COMPARISON OF FAN ENGINES AND ELECTRIC MOTOR COSTS WITH ELECTRICITY AT 1⅛ C. PER K. W. H.

The installation of a generating unit was contemplated for power purposes but this was discarded for reasons of economy. The following figures show the estimated additional cost of plant, fixed charges, etc., for both an isolated



ELEVATION OF SUPPLY AND EXHAUST SYSTEM FOR AUDITORIUM.



AUDITORIUM EXHAUST FAN.

electric plant and fan engines necessary for the operation of the two present buildings and the auditorium building. It will be noted that the costs are about the same for either.

POWER LOADS.

Administration Building. Supply Fans	30 H. P.
Gymnasium Building. Supply Fans ..	15 H. P.
Auditorium Building. Supply Fans. ..	20 H. P.
Boiler House. Pumps	15 H. P.
Total	80 H. P.

At 80% efficiency this would require a 100 H. P. or 75 K. W. generator.

COSTS.

Isolated Electric Plant.

1-75 K. W. Turbo-Generator in Place	$4000
Piping and connections.....	$1000
Electric wiring and switching.....	$ 500
	$5500
Interest @ 6%.....	$330
Depreciation @ 6%.....	$330
	$660

FAN ENGINES.

Cost of Engines.....	$3750
Additional piping.....	$1000
Oil separators, filters, etc.....	$ 200
Steam specialties, etc.....	$ 150
	$5100
Interest @ 6%.....	$306
Depreciation @ 6%.....	$306
	$612

COST OF OPERATION.

Buying all power and heating with live steam. The hours run are taken for 200 school days @ 8 hrs. per day, or 1600 hrs:

Power, 75 K. W. x 1600 hrs	120,000 K. W. H. per year
Total steam consumption	9,900,000 lbs. per year
Total oil @ 12 lbs. evaporation (2500 bbls)	825,000 lbs. per year
Total cost oil @ $1.45 per bbl.	$3,600
Total cost 120,000 K. W. H. @ 1⅛c.	1,350
Total	$4,950

Cost of steam per 1,000 lbs., 36½c.

Turbo-generator set, run to heat only and without waste of exhaust, buying balance of power:

Steam required by generating set @ 90%	5,500,000 lbs.
Heat value of exhaust steam	
Total steam received by system	9,900,000 lbs.
Total steam received from set	5,500,000 lbs.
Make-up steam required..	4,400,000 lbs.

Total steam to be generated:

For generating set	6,138,000 lbs.
For make-up	4,400,000 lbs.
Total	10,538,000 lbs.

Power received from set, assuming steam consumption of 60 lbs. per K. W. H.	102,000
Total K. W. H. required	120,000
Total K. W. H. required to be bought	17,900

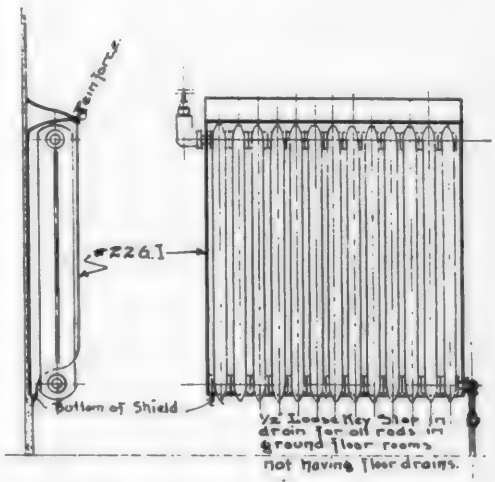
Total operating cost:

10,538,000 lbs. steam @ 36½c. per 1000 lbs.	$3,860
17,900 K. W. H. @ 1⅛c.	200
Interest and depreciation.....	660
Oil, supplies and extra labor	300
Total	$5,020

Fan engines, with stand-by motors, run to heat only and without waste of exhaust. In this case the cost was taken to be about the same as for a generating set:

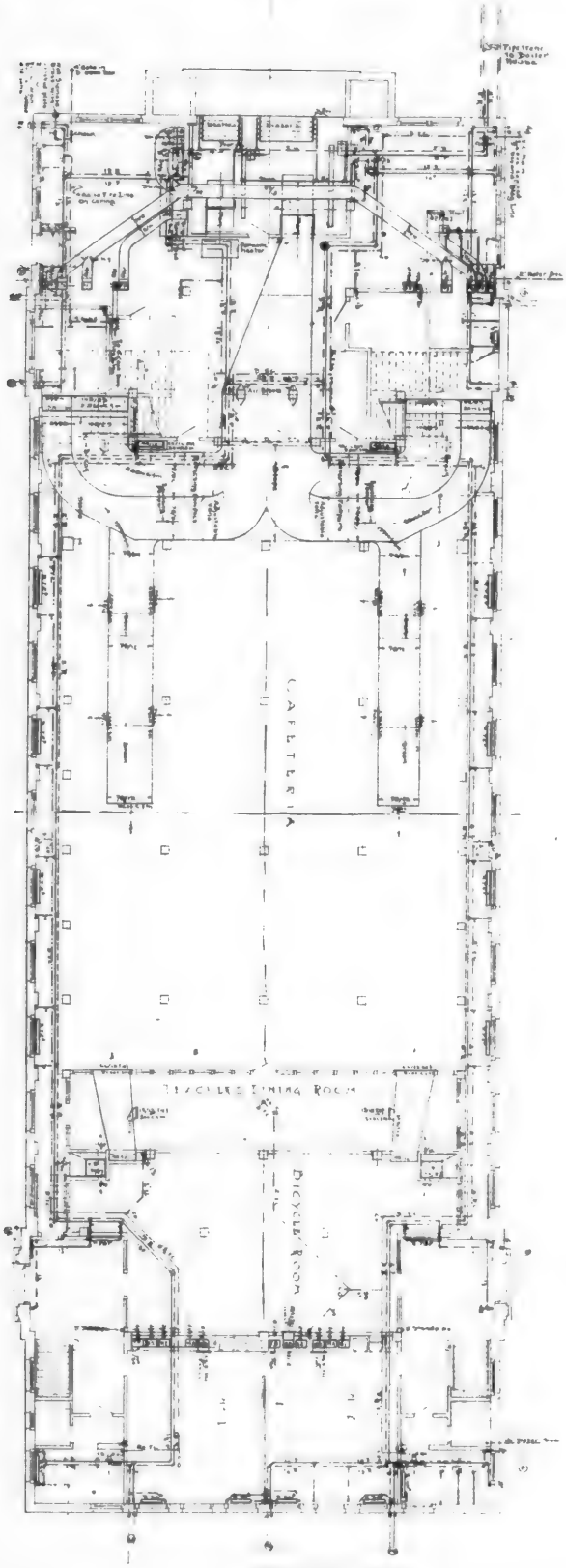
Fan engines, without motors, some exhaust wasted. 60 lbs. steam per H. P. hour assumed:

Steam delivered to engines 7,200,000 lbs.

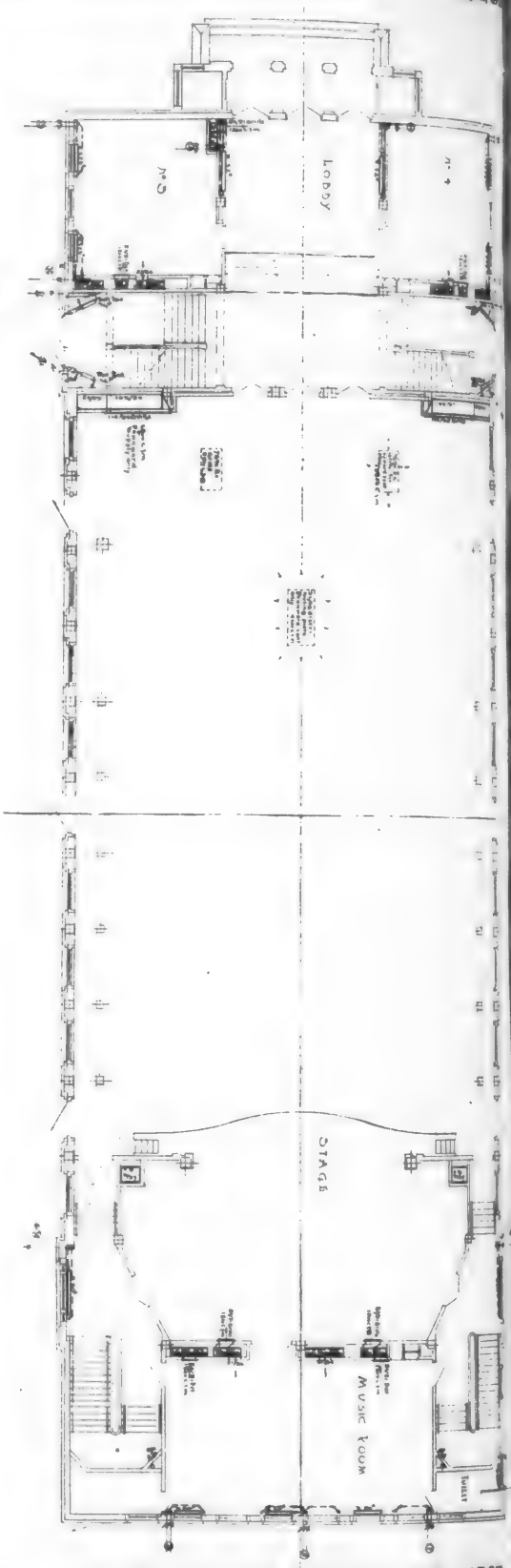


RADIATOR SHIELD

For oil rods on plastered walls and for rods under windows wherever the distance from top of rod to window steel exceeds one foot.

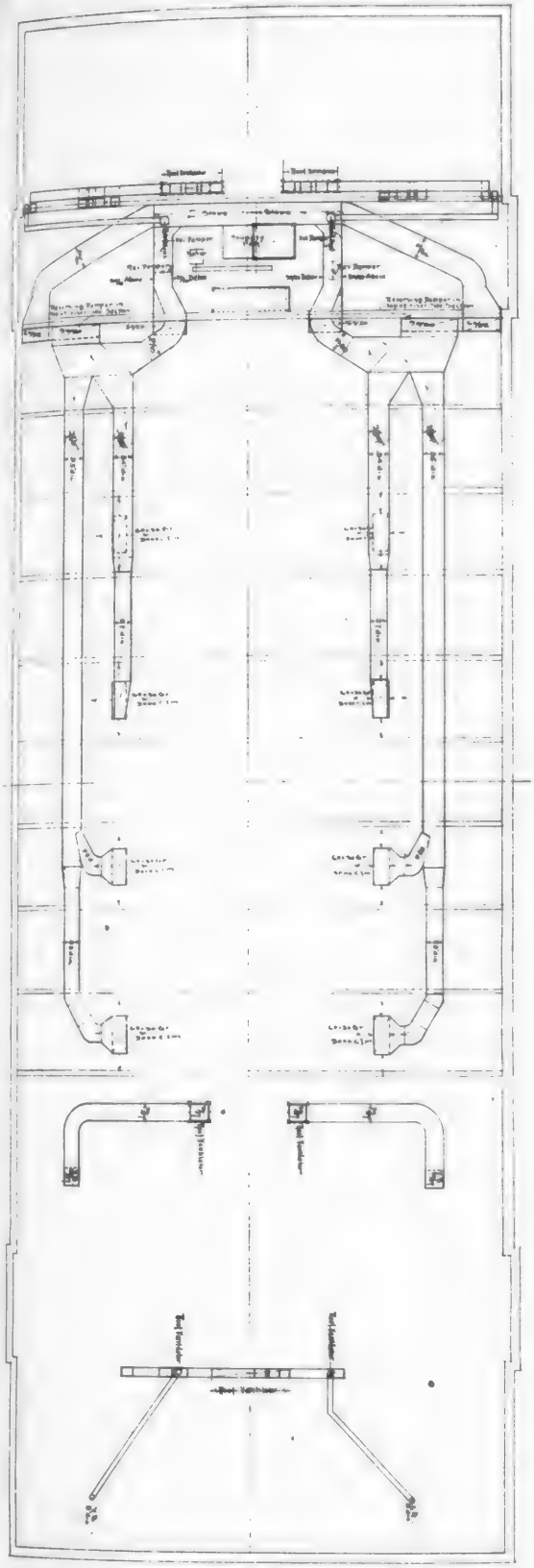


FIRST FLOOR.

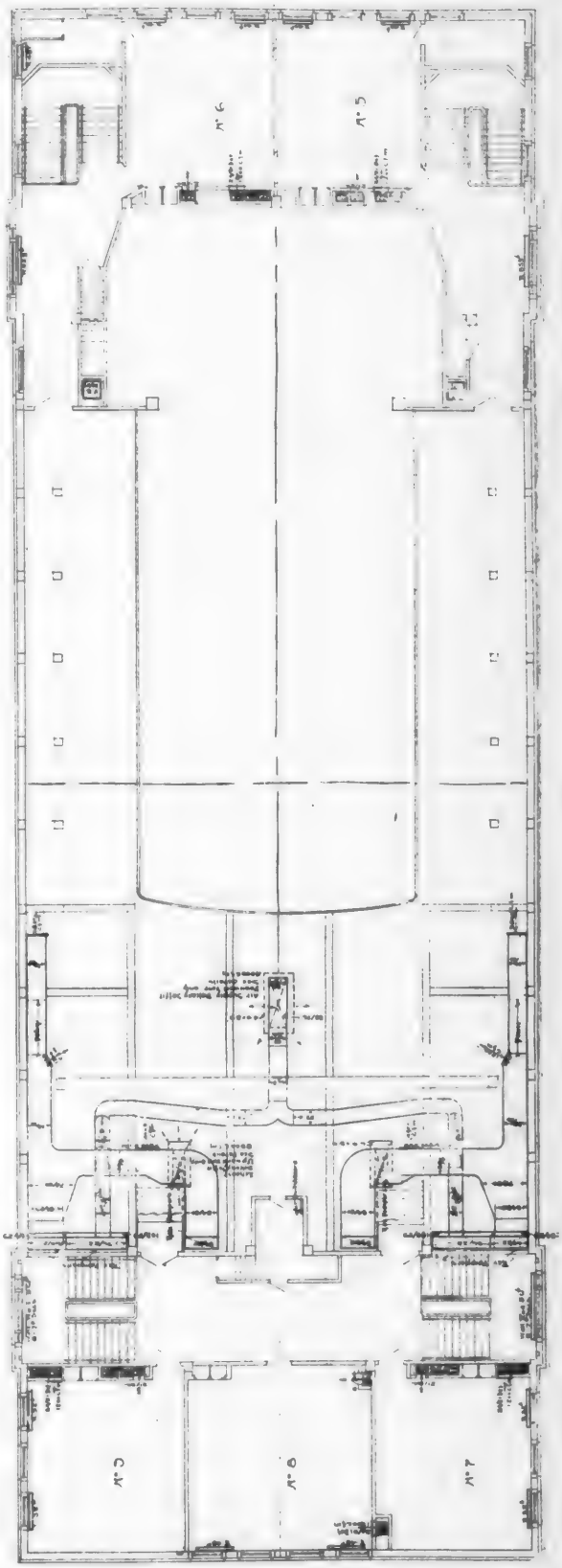


GROUND FLOOR CEILING. THE LARGE DUCTS SHOWN DISCHARGE INTO PLENUM ABOVE CEILING AND SUPPLY MUSHROOM VENTILATORS.

FRANKLIN HIGH SCHOOL AUDITORIUM.



ATTIC DUCT SYSTEM



SECOND FLOOR AND BALCONY DUCT SYSTEM.

FRANKLIN HIGH SCHOOL AUDITORIUM.

Exhaust steam delivered to system	5,500,000 lbs.
Make-up steam same as for turbo set	4,400,000 lbs.
Total steam to be generated:	
For engines	7,200,000 lbs.
For make-up	4,400,000 lbs.
Total	11,600,000 lbs.
Operating cost:	
11,600,000 lbs. steam @ 36½c.	$4,225
Interest and depreciation	612
Oil, supplies and extra labor	300
Total	$5,137

Cost of power and heat for the two present buildings and the proposed auditorium as estimated by the various methods:

Live steam heat, all power purchased	$4,950
Isolated plant, some power purchased	5,020
Fan engines, some power purchased	5,020
Fan engines, no power purchased	5,137

CHICAGO COMMISSION ON VENTILATION

CONSTRUCTION AND EQUIPMENT OF PORTABLE SCHOOL BUILDINGS

BY JOHN HOWATT AND SAMUEL R. LEWIS

II.

Following the report published in THE HEATING AND VENTILATING MAGAZINE for February, 1919, which describes the practice in various cities it is considered desirable to show plans and a description of a portable school which embodies the best features developed by our study.

Results obtained with the fabricated type of portable school answer for themselves, and we have no intention to extoll or to decry them since they are proprietary articles. The small panels used in the fabricated construction are favorable, as the sections can be handled with less danger of damage. The double-ceiled construction with paper between, seems to be warm, and while it would be improved, we believe, by even a small air space, we cannot criticise it adversely.

In erecting the sections there seems to be no reason why leakage of air at cracks should not be minimized, by using paper or even by using some gum-like substance which will serve as a gasket between the sections. The detailed construction of the joints is the province of the architect or manufacturer, and it would be improper for us to usurp this privilege or assume this responsibility.

We may with propriety, suggest the results which in our opinion should be obtained and may fairly show a method by which these may be obtained. We will, therefore, cover in our description a home-made house, with the under-

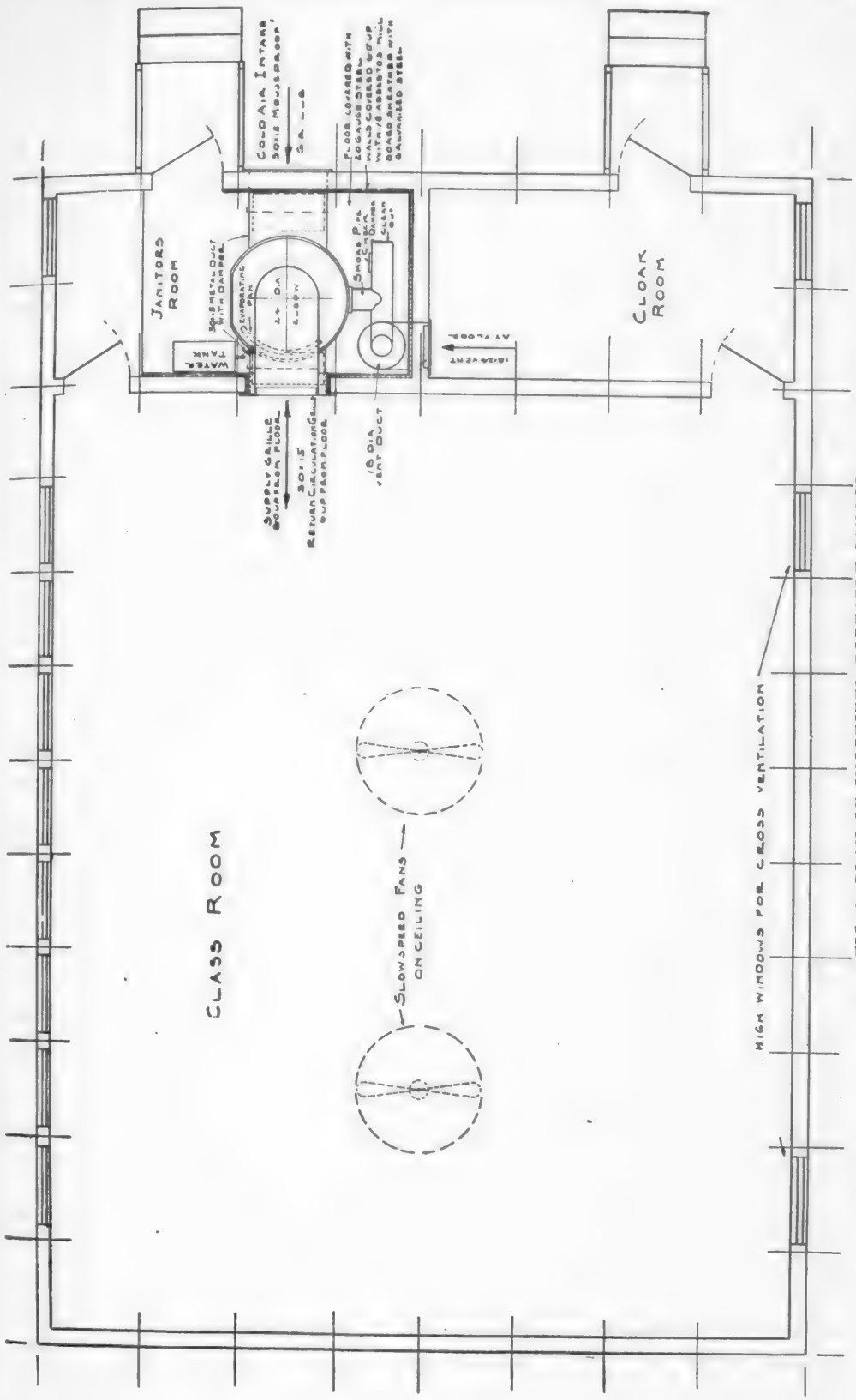


FIG. 8—PLAN OF SUGGESTED PORTABLE SCHOOL.
(The Cross Lines Indicate 3-Ft. Panel Points.)

standing that it may be in portable sections or not, as the situation may demand, and with the understanding that while studding construction is shown, no prejudice attaches to a semi-solid construction of high insulating value, such as has been described for the fabricated buildings. While the drawings show ceiled construction with paper, for lining, our experience in the use of wall-board has been favorable.

The plan, Fig. 8, is intended to lend itself to division into narrow wall panels. The teacher's desk should be at the wardrobe end, which necessitates that the windows shall be at the right of the building, as shown on the plan.

The vestibule is combined with the wardrobe, but is arranged so that it shall be heated by the air from the room on its way to the vent flue. The vent flue, being arranged to draw air from the wardrobe, insures an air circulation through the clothing, and when it is desired to close the vent flue it may be done very simply by closing the door from the class-room. A vent flue will remove air in proportion to the height of the column of heated air within it. Thus, by placing the vent flue close to the furnace we gain several feet of additional heated column, eliminate horizontal smoke or vent

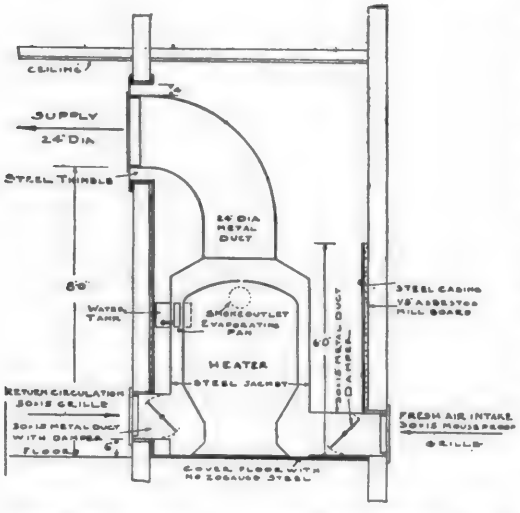


FIG. 9—SECTION THROUGH FURNACE AND FURNACE ROOM.

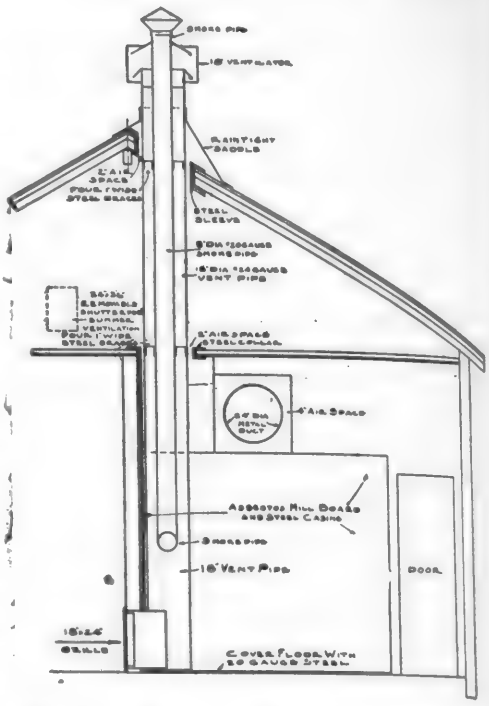


FIG. 10—SECTION THROUGH VENT FLUE.

ducts, reduce friction and lodgment of soot, and bring the flue through the roof near the highest point.

SEPARATE ROOM FOR FURNACE.

The furnace is in a separate room, accessible from outside, so that service may be given without dirt or distraction, also so that fuel may be stored. The full benefit of the finished schoolroom is available for school purposes. That service may be rendered by the teacher or pupils when necessary, a communicating door is provided. The furnace room floor is covered with No. 20 gauge steel, and the walls adjacent to the furnace and smoke-pipe are protected with 1/8-in. asbestos millboard, sheathed with metal. The air supply to the furnace may be taken from outside, and from inside, separately or simultaneously, by controlling two simple dampers, (see Fig. 9). The chimney has a check draft damper to be used in regulating the temperature. The points where ducts or flues pass through parti-

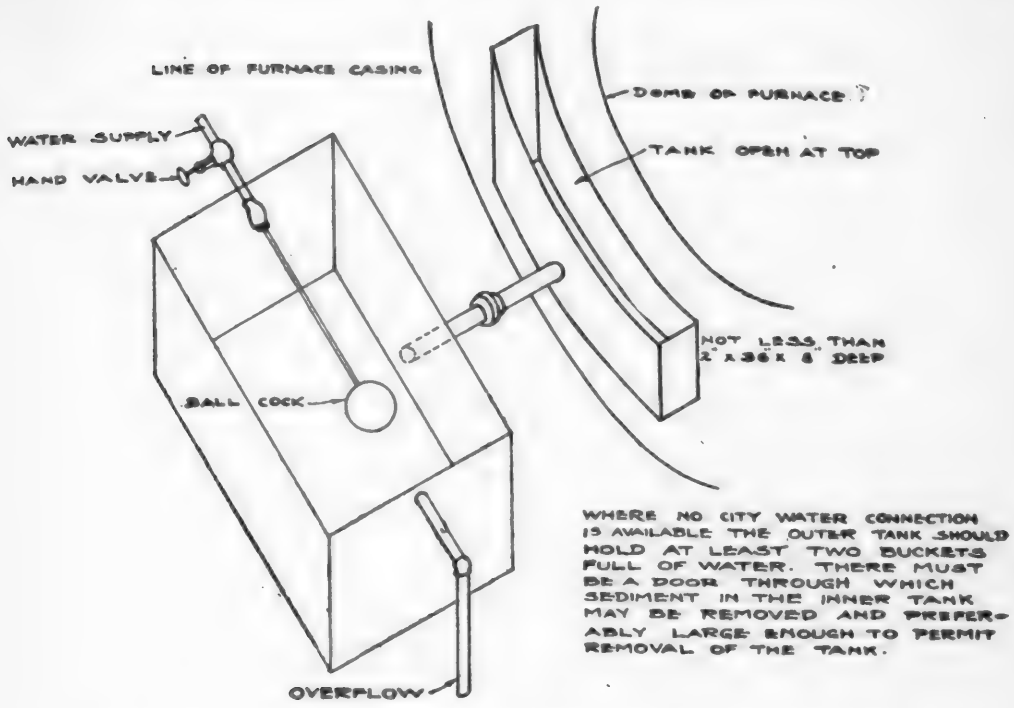

LINE OF FURNACE CASING
DOME OF FURNACE
WATER SUPPLY
HAND VALVE
TANK OPEN AT TOP
NOT LESS THAN 2" X 36" X 8" DEEP
BALL COCK
OVERFLOW
WHERE NO CITY WATER CONNECTION IS AVAILABLE THE OUTER TANK SHOULD HOLD AT LEAST TWO BUCKETS FULL OF WATER. THERE MUST BE A DOOR THROUGH WHICH SEDIMENT IN THE INNER TANK MAY BE REMOVED AND PREFERABLY LARGE ENOUGH TO PERMIT REMOVAL OF THE TANK.

FIG. 11—TYPICAL ARRANGEMENT OF WATER PAN FOR HUMIDIFYING.

tions, floors or ceilings are guarded by steel thimbles having wide air spaces (see Fig. 10). There is a double reservoir, consisting of an evaporating pan inside the furnace near the dome, communicating with an outside pan having preferably an automatic water supply (Fig. 11). The overflow arangement is of importance, and where city water is not available, with an automatic ball cock, the outer tank should have considerable capacity. The amount of water which this arrangement will evaporate will be surprising.

SUGGESTIONS FOR FURNACE DIRECTIONS.

An instruction sign, painted on metal and secured in place permanently, should be placed in the furnace room, and in addition to pertinent information for the particular furnace and fuel used, should embody at least the following:

"When firing the furnace always have an air supply to it from one or the other source for carrying the heat to the room. The duct on the left of the furnace at the floor, brings in cool air from outside and is called the fresh air duct. The duct on the right of the furnace at the floor brings in cool air from the floor of the school-room and

FIG 12—SECTION THROUGH WINDOWS.

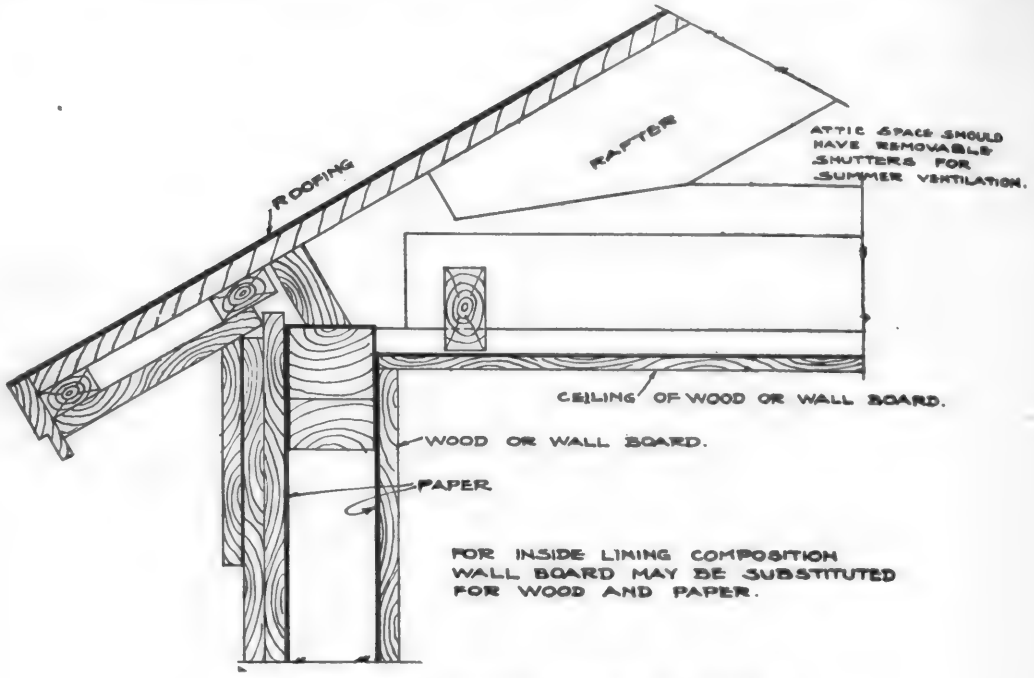

ROOFING
RAFTER
ATTIC SPACE SHOULD HAVE REMOVABLE SHUTTERS FOR SUMMER VENTILATION.
CEILING OF WOOD OR WALL BOARD.
WOOD OR WALL BOARD.
PAPER
FOR INSIDE LINING COMPOSITION WALL BOARD MAY BE SUBSTITUTED FOR WOOD AND PAPER.

FIG. 13—SECTION AT LINE OF EAVES.

is called the return air duct. Usually it is desirable to have both ducts open when the room is occupied. At night close the fresh air duct. When a strong wind blows directly into the fresh air duct there may be so much pressure as to cause cold air to blow through into the class-room through the return air duct. Remedy this by closing the latter, or by partly closing the fresh air duct. When the room gets too warm, open the check draft in the smoke-pipe and close the ash doors. Whenever the pupils are at their desks the door from the room into the cloak-room should be open so the vent flue will operate. At night this door should be closed. Keep the water pan full of water. The more fresh air you can use and keep the room warm, the better the condition of the pupils will be."

The drawing suggests the location for two slow-speed ceiling fans, such as our tests have indicated would be desirable for improving the distribution of the fresh air and the promotion of an even temperature.

MAKING THE JOINTS AIR-TIGHT.

In the construction of the building there should be no stinting of the use of strong air-tight building paper, with joints lapped over the critical points and sealed with pitch as shown in Figs. 12 and 13. The space under the floor

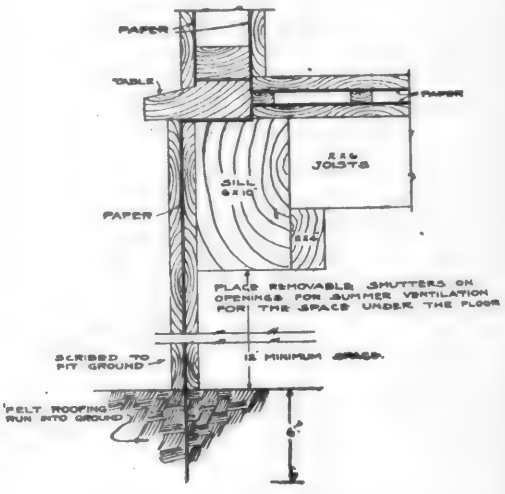


FIG. 14—SECTION THROUGH SILL, FLOOR, WATER TABLE, ETC.

should be made air-tight by double inter-sealed sheathing, and roofing paper buried in the ground for some distance (see Fig. 14). Tight shutters are provided on four sides below the sills and must be removed in summer so as to dry out the space and prevent rot. The floor may be double, with double paper and 1-in. strips to gain a dead air space, as shown, or may be built without the air space, with cork carpet, which is at least equally warm and much more easily cleaned. The floor and walls should be joined with a diaphragm of paper sealed in so as to prevent leakage at this critical point. A construction which makes all walls of double sheathing paper lined with spacing strips between, say, 1-in. thick, forming dead air spaces instead of the 4-in. space shown on the drawings, will justify itself. There should be wall plates at top and bottom to prevent any air circulation between the studs, and to act as fire stops. The window frames will shrink and cause leakage unless this is insured against, as we suggest, by carrying the paper around the frames. The room should have a tight ceiling forming a dead attic space, to prevent heat loss on cold days and overheating on warm days. This ceiling particularly should be paper lined, as boards used here very soon become sieve-like, due to drying.

Rules for Equipment and Care of Railroad Buildings.

In a manual on "Fire Protection for Railroad Properties," compiled by the United States Railroad Administration, some valuable hints are given on various matters connected with the heating of railroad buildings.

On the subject of the proper installation of heating apparatus, the following recommendations are made:

Steam pipes should be properly supported and kept away from woodwork and should be properly bushed where passing through woodwork. Greasy and oily waste or other inflammable material should be kept away from the same and clothing should not be permitted to hang on or near same. The overhead method of steam piping is preferred.

Chimneys and flues should be substantially and carefully constructed and not built up from posts or joists. Joists should not be permitted to run into the masonry work. All smoke pipes should run direct from furnace or stove to chimney.

All joists and woodwork should be protected by fireproof covering, metal and asbestos board, or by allowing sufficient air space between them and all heaters or furnaces and their pipes.

STEAM MAINS AND STEAM PIPES.

Regarding steam mains and steam pipes, the manual states:

Pipes conveying main supply of steam should be wrapped with magnesia or asbestos covering, and where passing through wood partitions should have a clear space of at least 1 in. Steam-pipe covering should preferably be carried in a single piece through floors and partitions.

It is advisable to examine covering, which may be done with a penknife. Very often it will be found that a cheap covering of combustible material has been substituted.

Steam mains should not rest on combustible material; should have metal hangers to support them, and the outer covering should be fastened to pipe with brass bands.

Steam heating pipes should rest on metal hangers or supports, and where passing through combustible floors or partitions should have at least a ½-in. air space from combustible material and a metal collar or thimble.

Steam radiators and steam pipes must not be used as receptacles on which to dry rags, clothes, or other combustible material.

Where radiators are placed in window recesses, or concealed spaces, care should be taken to see that such places have a noncombustible lining and ample air circulation. These inclosures should be cleaned and kept free from dust.

All steam pipes should be so installed that they can not come in contact with combustible material of any character.

General recommendations are given in connection with boiler houses, boiler settings and boiler stacks, also in connection with shavings and sawdust disposal in woodworking mills. There are also recommendations for the storage and handling of bituminous coal.

THE HEATING AND VENTILATING MAGAZINE

A Monthly Journal of Engineering Progress
Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 16 April, 1919 No. 4

Published Monthly at Cooperstown, N. Y., by the
Heating and Ventilating Magazine Co.
Executive and Editorial Offices, 1123 Broadway
New York

A. S. ARMAGNAC.....*President*
GUSTAVE PETERSEN....*Secretary and Treasurer*

A. S. ARMAGNAC, Editor
GUSTAVE PETERSEN, Business Manager

European Representative:
W. G. HOLLINWORTH, 304 High Holborn
London, W. C.

Subscription	$2.00 per year
Canada	2.25 " "
Foreign Countries	2.50 " "
Back numbers	25 cents each

IN NAMING John R. Allen as the director of the Bureau of Research of the American Society of Heating and Ventilating Engineers assurance is given to the heating industry that the bureau will fully meet all expectations regarding the manner in which its investigations will be conducted and, in all probability, in the results to be achieved. This assurance is most welcome because perhaps the principal objection raised to the project was the fear that in some way the bureau's findings might be affected by bias or preconceived opinions. Those who are familiar with Professor Allen's career know how incapable he would be of permitting any improper turn to the investigations. This, backed up by the safeguards that have been thrown around every phase of the bureau's activities, is a guarantee that the next few years will see some momentous achievements in the art of heating and ventilation.

The financial side of the project, too, is taking even better shape than its promotors had hoped for. In addition to the fund raised by the heating trade, which, at last accounts, amounted to over $18,000 per year for the five-year period, it is now announced that the Bureau of Mines itself will have at its disposal at least an equal amount, to be devoted exclusively to the heating engineers' research bureau. Thus, instead of the original $10,000 per year that was at first sought for, the bureau is able to arrange its programme on the basis of an income of not less than $40,000 per year. Nor is this all. Other bodies, like the National District Heating Association and the National Warm Air Heating and Ventilating Association, have a direct interest in the work of the bureau. Arrangements have already been made to have the central station heating men hold one of the sessions of their forthcoming annual convention at the Bureau of Research in Pittsburgh and there is every likelihood that their organization, as a body, will desire to share in some phases of the work.

According to the latest plans the heating engineers' society will hold its summer meeting in Pittsburgh, June 10-12, while the National District Heating Association will meet in the same city June 10-13. June 12 has been set aside for a joint meeting of the two organizations in the auditorium of the Bureau of Mines building, during which an inspection will be made of the facilities of the Research Bureau, accompanied no doubt by a discussion of the various investigations to be made.

Too much emphasis can not be laid on the fact that the Research Bureau belongs to the whole heating trade and its activities should be looked upon as trade activities of the most practical nature. The industry has much to be proud of in the way it has supported the movement, while the functions of the society are as they should be in exercising exclusive supervision of the work.

THE RECONSTRUCTION ERA

Industrial Board Appointed by Government to Stabilize Prices.

Due largely to the efforts of the National Federation of Construction Industries, a board has been appointed, known as the Industrial Board of the Department of Commerce, for the purpose of stabilizing prices for basic materials. Its programme will be supported by the Council of National Defense. In stabilizing prices those in the important basic industries have been taken up first. While no one is under compulsion to adhere to these prices, the procedure has already resulted in establishing a normal basis for the resumption of building activities.

The history of the formation of the Industrial Board is interesting as showing the achievements the National Federation already has to its credit. Early in February a conference of representatives of the federation was held with Secretary of Commerce Redfield in Washington, with the avowed purpose of stimulating trade throughout the country. The vital subject of price reductions was discussed, as well as the labor situation. Secretary Redfield suggested that it would be well for a board to be appointed representing the various industries of the country, to meet with him in Washington, with the object of stabilizing their marketable products to a more or less pre-war basis that would be satisfactory to the producing interests and which, as a result, might stimulate production and sales of these products. He pointed out, however, that legislation to effect such an organization would be impossible at this time and suggested that a voluntary organization be formed, representing the industries, and that this voluntary organization be headed by possibly two or three of the biggest men in each industry.

It was then brought out that this organization might be similar to the War Industries Board in its functions. It was suggested that they set fair prices for their products and that these prices should then be transmitted by Secretary Redfield to the Director of Railroads, for instance, with the request that the director issue a statement that the railroads would be willing to purchase materials at the stated prices.

With the proper publicity that could be given to this by the secretary, the people of the United States will, it is believed, awaken to a realization of the advisability of placing their requirements for various commodities immediately, instead of holding back for further reductions.

A tentative organization was formed on these lines and President Wilson has since aproved this action with the understanding that the new board would proceed on the lines outlined at the conference.

Supplementing the anouncement of the creation of the Industrial Board, Secretary Redfield gives a summary of the industrial situation and an outline of the work of the board.

"There exists at the present time," he says, "an abnormal situation in the industrial world, a condition of stagnation of business and industrial activity. The high price condition is undoubtedly the cause of most of the business inactivity and of the widespread unemployment of labor. The living costs are unusually high and will continue high until there are substantial reductions in the cost of the necessary staple foodstuffs.

"A large and, it is believed, satisfactory latent buying power exists in the country, an abundance of money. It is therefore apparent that the trouble resulting in the present stagnation is due to the continuance of the high, uneven, unstable prices of war times, which were, in many instances, agreed to by agencies of government functioning for war purposes and not to any unhealthy general condition. These abnormal prices still remain because there has been provided, up to this time, no agency to bring about the necessary reductions."

Secretary Redfield recommends immediate reductions from the high prices to the proper level, so that the consumers may be justified in buying.

The complete personnel of the Industrial Board is as follows:

Chairman, George N. Peek; formerly vice-president, Deere & Co., Moline, Ill.; Samuel P. Bush, president Buckeye Steel Castings Co., Columbus, O.; Anthony Caminetti, commissioner of immigration; Thomas K. Glenn, president Atlantic Steel Co., Atlanta, Ga.; George R. James, president Wm. H. Moore Dry Goods Co.,

Memphis, Tenn.; and T. C. Powell, director Capital Expenditures of the Railroad Administration.

At a meeting March 7 the board authorized a statement analyzing the present condition, its cause, its remedy, the results to be expected and the objections to the course proposed.

Referring to the "Condition," it was stated that although commercial stocks are depleted, money is plentiful, building and construction are several years in arrears of necessity, a long period of enforced economy is greatly relieved and markets are in prospect in all parts of the world, still buying is timid and has been decreasing in volume, money is also timid and remains in bank, some mills and factories are idle, construction of public and private works has not begun and non-employment is spreading.

The "Cause" is gone into at length. The sudden termination of the war is mentioned as leaving a highly-inflated and very irregular market which is generally far above what the peace demand will support. The normal operation of the law of supply and demand, it is pointed out, cannot cure what it did not cause, first because it cannot operate until buying begins and second, because buying cannot begin until we have a more normal, stable and homogeneous market.

Everybody knows, it is stated, that some prices must fall. No one dares buy until they do fall and even then everyone will wait to see how far they will fall. The law of supply and demand would cure the situation eventually but we cannot afford to wait. By sane and temperate action all this can be avoided.

Under the "Remedy" is is stated that the condition must be cured as it was caused, that is, by comprehensive cooperation and agreement between industry and government.

As soon as a stable and wholesome scale of prices is achieved, the cost of living will have been so far reduced as to create automatically reductions in the price of labor without interfering with American standards and ideals.

It is expected that the assurance to the country of a market stabilized at the lowest reasonable level will loosen such a flood of buying for the recreation of stocks, the making up of arrears in the building programme, the feeding of needs long starved by economy and the invasion of the world markets, as may stand unprecedented in this country.

One of the objections that has been raised to the plan of the Industrial Board is that a general reduction in selling prices will force industry and commerce to take a loss on products purchased at war prices. The answer made to this is that it is true and inevitable, whether the plan is attempted or not, but under the proposed plan better adjustments are possible. Buying will begin immediately, the overhead of continuing high-cost operations through a period of stagnation is eliminated and, finally, much of the loss will be recouped by buying at fair prices and selling in the inevitably increasing market.

It is expected that the activities of the Industrial Board will be temporary and are intended only to give governmental assistance to aid the law of supply and demand in resuming its normal functions.

The offices of the Board are in the Council of National Defense Building, 18th and D Streets, Washington, D. C.

Building Materials in Hands of Construction Division of the Army.

In a statement made public by the Director of Sales, War Department, it is announced that some time ago all construction projects of the War Department were directed to send in inventories of materials and equipment which were surplus and, consequently, available for sale or transfer. These inventories, as of December 31, 1918, have been submitted to the Chief of Construction Division of the army and classified. They include lumber, heating and plumbing equipment, cement, wall-board, mill-work, roofing, and miscellaneous building material and a variety of other materials. The total cost to the government of the materials mentioned is approximately $12,000,000. There is, in addition, about $3,500,000 worth of construction equipment, office equipment, small tools, etc.

Great quantities of the above material are being consumed inside the War Department, and the Dpeartment is making no purchases where material can be obtained from some other project.

Inasmuch as the Construction Division has probably 90% of all building materials in the War Department, it is felt that there is no cause for anxiety on the part of the public with respect to this surplus. At each of the 476 projects there is a constructing quartermaster who will make sales of his own surplus under general instructions issued from the Director of Sales Office. This means that a majority of this surplus will be absorbed in the particular locality in which it is located.

Plan for Organizing Communities to Aid Demobilization and Adjustment.

A plan has been formulated by the Council of National Defense for organizing the citizens in each community as Community Councils, not only to help solve the reconstruction problems as affecting their respective localities, but to operate as a permanent agency for the development of community fellowship and co-operation. The immediate task is in connection with the returning soldier and sailor. Suggestions are also offered for work in connection with food supplies, Americanization, and other activities.

In a circular issued by the council (Community Council Circular No. 4) full directions are given for forming a community council, together with a programme of the work its should undertake.

Progress of Work for Retraining Disabled Soldiers.

Attention is again called to the fact that the government is placing disabled soldiers, sailors and marines in the various institutions of the country for retraining for peace pursuits, absolutely without cost to the men themselves. In fact they receive $65.00 per month as a support fund, with an allowance for dependents, and placement in a job, if the course be for a wage earning occupation.

While this is known to the general public, many cases are found where the knowledge has not reached the soldiers themselves. There are, altogether, some 500 trades, professions or other occupations from which a choice may be made by the disabled man, as he is by no means confined to manual work. Up to February 1, there were registered on the books of the Federal Board for Vocational Education at Washington, 22,851 cases of disabled men discharged from the service, of whom 13,000 were discharged prior to the granting of permission to the Federal Board for interviewing them at hospitals. Not being allowed by regulations of the surgeon-general's office until recently to establish contact with these men while in the hospitals, most of them have gone out into civil life and many of them are floating about the country, not aware of the benefits which Congress has provided for them. A man disabled in a cantonment or concentration camp, or during training is just as much entitled to retraining and placements as if he had been injured on the battle field.

Those disabled who for one reason or another have beeen declared "non-compensable cases" by the Bureau of War Risk Insurance, also now have a chance for retraining. This is made possible through the $150,000 fund placed by the Elks at the disposal of the Federal Board. There are no restrictions whatever upon the use of the Elks' fund.

"Own Your Home" Campaign Plans Announced by Department of Labor.

Plans adaptable to any city in the United States, for an effective "Own Your Home" campaign, have been formulated by the U. S. Department of Labor and the literature is now ready for distribution through the Division of Public Works and Construction Development. Twenty cities are already getting under way with their drives for home building and home owning. The plan contemplates a general committee made up of civic and industrial leaders, with sub-committees on finance, publicity and campaign methods, mercantile institutions, etc. The function of each committee is explained in detail in the Department's manual, with suggestions on handling specific problems.

Government Aid in Readjustment Problems.

Those who heard the address by Frank J. Pollay before the Central Supply Association, in Chicago, February 19, were so impressed with the points he made that they voted to have his remarks reprinted and distributed.

Mr. Pollay is a special agent of the Division of Public Works and Construction Development, of the Labor Department, and his statements were considered of the utmost significance. Mr. Pollay said, among other things:

"The government in Washington is very, very anxious to get in touch with all of you and asks your co-operation in helping us tide over the next three to six months which are likely to be a critical era in our government.

"We are getting the back-wash of the war, gentlemen, and that back-wash is unpleasant. The unrest which we have today, the soap-box orator, the man who hopes to see our country go up in the air after a bomb, that man has developed largely under very bad conditions in Europe.

"I want to put before you the one idea that we have in our mind and that is that the old order has changed, whether we

like it or not, and a new world has come out of this war.

"We have reached a point where patience ceases to be a virtue with certain people, and we are prepared to tell now, just as you saw it in the papers the other day, that the time has come when any man having had the opportunity in America to be a decent citizen, and will not be a decent citizen, and has one creed and that is, To Hell with the Government, that man goes out of our country.

"We are the only country in the world to-day that has the money, that has the resources, that has the raw products, that has the men. We have got everything except confidence and a little common sense. You are sitting back, you are letting this condition get worse and worse every week in your country. Your percentage of unemployment has been rising every week.

"When you men go back to your own locality, look up any deferred public work. You know where some roads are needed, and those roads have not been built. How many different cities are building school houses that were cut off during the war? Be practical. Get hold of your mayor, get hold of your common council and find out why that work is not being done, why roads are not being built. If it is not done, write to us. We will get behind that as a research bureau and push it along. If anybody raises the question that it is going to take extra money, tell them that it must be done, independently of the cost. We are working along that line, not only in the federal government, but in the State.

"Another thing that we have learned as a practical thing. If they ask you to figure on work on pre-war prices, you say, 'That has passed, we cannot help it.' Figure that again under the modern basis of prices on material and labor and I will give you my word that in many cases you will find that your actual figures are less that what the architect estimated. We have tested it and in many cases that is true.

"To make a concrete illustration, this is what must be done. Suppose that you have figured a contract on the pre-war price, at $200,000. Now, you ask for bids under present conditions and the bids might be $240,000. Everybody throws up their hands and says, 'No, we won't do it. We will wait for six months and prices will come down.' In the first place, prices are not going to come down, and therefore you can tell him that you will figure this as a modern constructive proposition, and you will find that when your estimate comes in, that it will not be $240,000. Or let us figure it we will say on the basis of $30,000,—thirty, forty or fifty thousand dollars, make the public understand that it is going to cost about $250,000, and when you put up that building for $220,000 or $230,000, they will say: 'That is a good proposition.'

"Your work will go through. We have tested it. It is a practical thing. It is a practical thing to do that same thing with your road work. If you do that, you will get public sentiment with you, and you will get your work started."

Building Data in the United States.

Questionnaires sent out by the Division of Informaton and Education of the Department of Labor to builders, architects, manufacturers, banks and other institutions, and to city, county and State officials throughout the United States have resulted in some valuable figures as to the actual condition now existing in connection with building and constructon work.

Of 20,000 questionnaires sent out, 6,225 were filled out and returned. They showed public and private projects in hand approximating a total valuation of $1,708,738,936. Of these 3,226 are public such as street paving, road construction, water works, sewers, public buildings and water front work, approxmating in value $1,249,548,825. There were 2,999 private projects reported of a total valuation of $459,190,111. These consist of apartment houses, residences, hotels, business buildings, factories, places of amusement, churches, social halls and railroad work.

The division has compiled these data according to States and classification of projects and is now sorting the projects into those that are still being held up by the high cost of materials and labor, financial difficulty, shortage of materials or labor and other causes, and those which are going ahead. This information is now available so that building projects in all parts of the country are able to analyze the situation confronting them by comparison with the situation in all other parts of the country.

In total valuation of projects, both public and private, by States, Illinois stands well in the lead, according to the preliminary report just made, with New York second and Ohio third.

The above figures show that, while Illlinois leads in value of projects, to the extent of $61,262,635 over New York, the number of projects reported in Illinois falls far short of the number reported in

the other two States. One item which swells the Illinois private project column is the New Union railroad station in Chicago, to cost $60,000,000 but that does not affect the public projects in Illinois which leads all the other States.

Following is the preliminary tabulation of the numbers and the valuations of the projects, both public and private, compiled by the Division of Information and Education, by States, alphabetically arranged:

	Private Projects		Public Projects	
State	Number	Estimated Cost	Number	Estimated Cost
Alaska	2	$ 100,000	2	$ 500,000
Alabama	22	981,750	32	5,784,800
Arizona	8	1,275,000	26	8,368,348
Arkansas	21	824,000	55	10,637,948
California	58	9,863,000	85	93,444,315
Colorado	22	3,059,000	45	10,534,920
Connecticut	57	4,329,000	58	18,639,506
Delaware	2	60,000	12	6,231,000
District of Columbia	18	2,318,500	4	4,100,000
Florida	8	783,000	6	376,869
Georgia	7	309,200	19	10,820,000
Idaho	6	179,500	35	6,584,370
Illlinois	141	94,697,000	220	130,877,476
Indiana	69	7,919,226	105	12,212,798
Iowa	93	6,642,400	124	20,017,933
Kansas	40	6,825,500	97	28,270,374
Kentucky	34	2,394,800	52	7,102,500
Louisiana	40	4,529,000	63	40,727,930
Maine	23	2,047,050	27	3,546,700
Maryland	37	5,942,500	23	8,592,508
Massachusetts	103	10,083,440	123	35,180,013
Michigan	77	37,994,700	149	93,110,694
Minnesota	61	8,654,360	87	28,473,894
Mississippi	6	239,000	32	10,820,530
Missouri	124	25,664,820	102	98,704,885
Montana	30	1,007,300	31	4,378,521
Nebraska	37	9,127,500	45	8,050,500
Nevada	—	—	5	1,760,500
New Hampshire	11	889,800	9	2,011,671
New Jersey	118	32,751,300	106	22,207,904
New Mexico	2	328,953	24	3,803,720
New York	405	43,738,356	257	120,574,485
North Dakota	12	565,500	26	2,345,500
North Carolina	12	971,500	21	2,750,500
Ohio	424	37,685,515	226	103,232,691
Oklahoma	20	2,900,500	58	6,146,500
Oregon	17	757,500	22	9,556,267
Pennsylvania	454	48,341,368	206	68,103,295
Rhode Island	10	480,800	12	14,207,502
South Carolina	26	1,649,273	20	32,684,500
South Dakota	18	2,635,000	47	2,786,042
Tennessee	23	706,800	30	5,918,875
Texas	71	6,441,200	69	14,403,000
Utah	15	4,564,000	63	15,514,263
Vermont	11	285,500	4	1,032,500
Virginia	53	6,707,600	46	30,107,200
Washington	35	4,604,500	69	42,314,217
West Virginia	35	6,763,500	57	9,645,362
Wisconsin	49	2,729,900	169	28,521,020
Wyoming	9	3,323,000	9	2,250,000
State not indicated	23	1,518,200	14	1,531,300
Total	2,999	$459,190,111	3,226	$1,249,548,825

MODERN PRACTICE IN VAPOR HEATING

X.—The Dunham System.

Editor's Note.—*For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or therograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

In the Dunham system, as developed by the C. A. Dunham Co., Chicago, Ill., the piping is arranged as shown in Fig. 1. This is a closed return system, with each radiator having a trap which prevents the steam entering the return line.

The steam passes from the boiler B into the steam main SM in the usual manner and up to the radiators, into which it flows through the Dunham packless inlet valve,

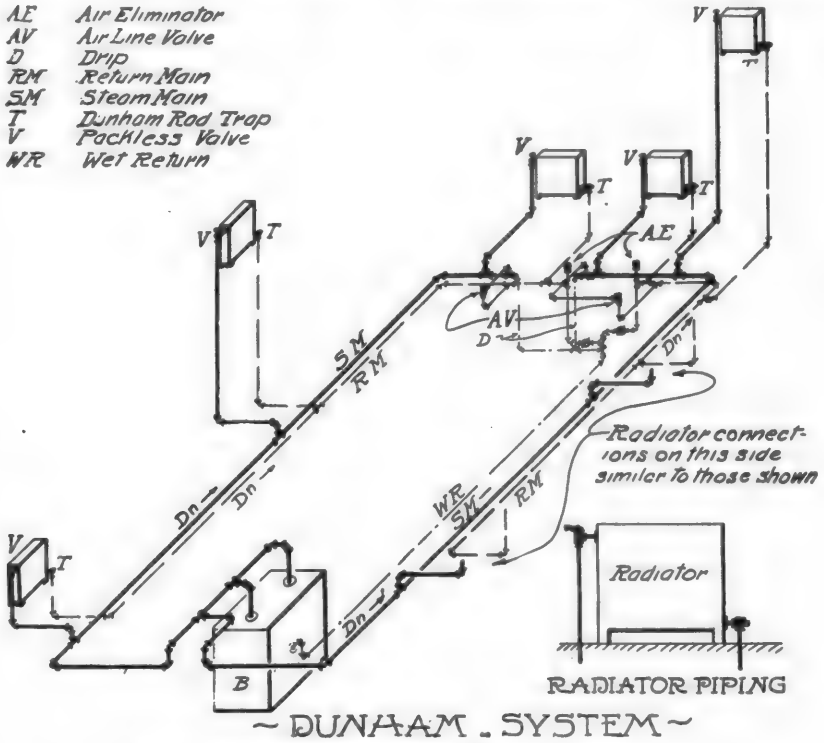


FIG. 1.—TYPICAL LAYOUT OF DUNHAM SYSTEM.

a sectional view of which is shown in Fig. 2. This valve utilizes a series of diaphragms for allowing the free up-and-down movement of the spindle without steam leakage, and at the same time obviating the possibility of leakage without the use of packing or stuffing boxes. Hard oil is inserted in the chamber on the upper side of the diaphragm to keep the threads permanently lubricated and make the handle operate easily.

The body of the valve is constructed of pure red brass, the handle of cocobolo, and the diaphragms of a specially constructed metal. This valve is not made in the graduated type (although it is equipped with plate and indicator showing when valve is "On" and "Off") as the Dunham Company does not believe in the possibility of graduating the supply of steam to radiators. The manufacturers state that they believe the amount of steam that will flow through a certain orifice is dependent upon the differential in pressure as between one side of that orifice and the other and that in a heating system this differential is beyond the control of the operator. It is next to impossible to maintain an absolutely constant pressure of steam upon the boiler, and it is quite impossible to regulate accurately the condensing powers of the radiator. Also that while some per-

sons claim that they are able to positively regulate the pressure upon the boiler, no one claims to be able to establish a constancy in the outside weather conditions, the changing of which also changes the condensing capacity of the radiator. Aside from this the company maintains that the graduating feature, even if practical, would not be used in the manner intended, because when a room in a building becomes chilly, the inlet valve is not graduated but opened full wide so that the temperature of the room will be brought back to the proper point as quickly as possible; likewise, if the room becomes too warm, the operator will close the valve entirely so that the room will cool off as quickly as possible. The construction of the Dunham valve, however,

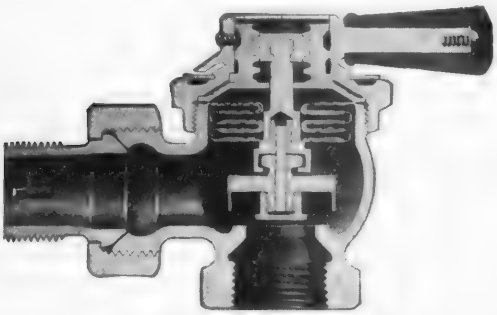


FIG. 2.—SECTIONAL VIEW OF DUNHAM PACKLESS INLET VALVE.

permits it to be partially opened or closed at will, thus restricting the flow of steam to the radiator the same as for other valves of graduated type.

This valve can be used on any two-pipe steam heating system, either vapor, vacuum or pressure. It is made in the angle-pattern, lever-handled type only, and for that reason it is recommended only for radiators with top connection, although it will

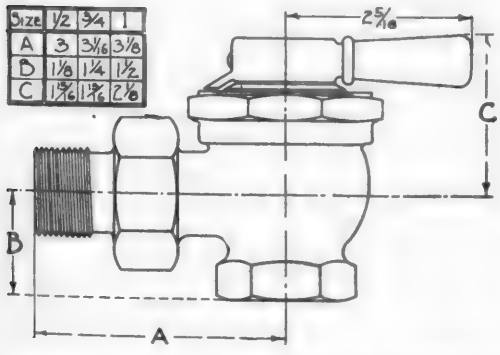


FIG. 3.—DIMENSIONS OF DUNHAM PACKLESS INLET VALVE.

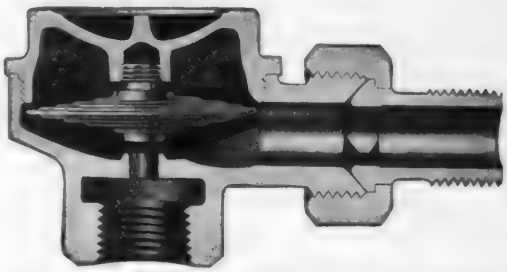


FIG. 4.—SECTIONAL VIEW OF DUNHAM RADIATOR TRAP.

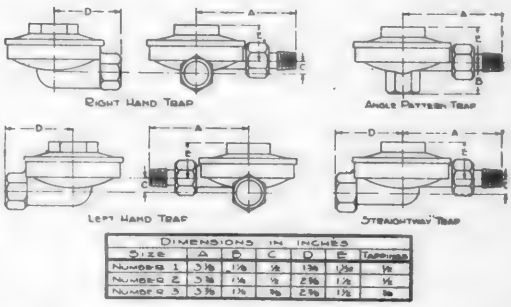
operate just as satisfactorily when connected to the bottom of radiators.

The dimensions of the inlet valve are as shown in Fig. 3 and it is made in three sizes only: ½-in., ¾-in. and 1-in.

The valves recommended for various sizes of radiators are as follows.

½-in. up to	40 sq. ft.
¾-in.	41 to 100 sq. ft.
1-in.	101 to 180 sq. ft.

After passing through the radiator the air and condensation escape through the



DIMENSIONS IN INCHES

Size	A	B	C	D	E	Tappings
Number 1	3 3/16	1 1/8	½	1 3/16	1 5/16	½
Number 2	3 3/16	1 1/4	½	2 5/16	1 ½	½
Number 3	3 3/16	1 ½	½	2 5/16	1 ½	½

FIG. 5.—DIMENSIONS OF DUNHAM RADIATOR TRAP.

Dunham radiator trap, a sectional view of which is shown in Fig. 4. The operation may be briefly described by stating that the disc, or moveable part of the trap, is anchored rigidly to the cover and contains a combination of volatile fluids. These fluids are hermetically sealed within the disc, and indefinitely retain the latent power of expanding and contracting in response to changes in temperature. On the lower portion of the disc is the float valve which hangs over the large opening of the trap that leads direct to the return line. When connected to the radiator there is nothing to impede the flow of air and water, and they pass uninterruptedly through trap from the radiator into the return pipe.

When the radiator has filled with steam and the steam surrounds the disc in the trap, the volatile fluids within the disc are heated and vaporized, thereby creating a pressure

within the disc; this internal pressure expands the disc, the valve seats over the opening, and waste of steam is prevented. Subsequent water and air forming in the radiator fall to the bottom, surround the disc, condense the gases within it, and the disc contracts, raising the valve from its seat and allowing the air and water to pass out into the return line; steam following behind the air and water, causes disc to again close.

The Dunham radiator trap is for use on all two pipe steam systems, using steam from a minus pressure, as in the case of a vacuum system, up to 10 lbs. pressure above atmosphere; it can be applied on either steam or hot water type radiators. The use of hot water type radiators is recommended, however, as circulation through the radiator takes place more quickly and at a lower steam pressure.

These radiator traps are made in the several sizes shown in Table I, and in four patterns, namely: angle, straight-way, right-hand and left-hand. All traps are furnished, regularly, nickel-plated, with nut and nipple threaded right hand; the dimensions of the traps are shown in Fig. 5.

TABLE I.

Size	Pipe Connections In. Diam.	Capacity Sq. Ft. of E. D. R.
No. 1	½	100
No. 2	½	350
No. 3	¾	450

The steam main pitches on down to the point when the last radiator connection is taken off. Here an air vent is located to relieve the air, the pipe being run to a Dunham air line valve which permits the air to escape into the return line, while the condensation flowing along the main is relieved by a drip at the end of the main which drops down under the water line and is connected to the wet return to the boiler.

The return main runs parallel with the steam main and pitches down in the same direction. At the end of the run a tee is placed and the condensation passes off through the bottom outlet of the tee and back into the boiler through a check valve. The level of the return main must be kept at least 24-in. above the boiler water line as far as to the location of the above mentioned tee.

This is owing to the fact that from the top outlet of the tee a connection is made to a Dunham air eliminator valve which relieves all the air in the system by allowing it to escape into the atmosphere.

LEGAL DECISIONS

Heating Apparatus as Realty Fixtures.

The New York Appellate Division holds, Realty Associates v. Conrad Const. Co., 173 N. Y. Supp., 25, that each complete steam heating apparatus is a fixture, and therefore realty. Radiators or boilers cannot be considered as separate from the steam-heating plant of which they are integral parts, under a contract between a conditional purchaser who installed them and the owner of the premises. Each adjunct or necessary appurtenance to the steam-heating apparatus had the same status as the apparatus in its entirety.

Uncovered Hot Water Pipes Part of Radiation.

The Indiana Public Service Commissioner holds, *re* Interstate Public Service Company, that uninsulated hot-water heating pipes on a consumer's premises should be added to the amount of radiation surface to be billed. The commission states as a reason for this that it is a fact that such pipes, which are often exposed to the outdoor air, radiate more heat per square foot of surface than do radiators located in warm rooms. Central-station hot-water heating is, in simplest form, the conveyance of heat units contained in the coal pile at the plant, through the medium of water, to the patrons' premises. In other words, the best in the coal is directly translated into hot water, and, as a conservative measure, such coal must be limited to useful purposes.

The commission considers that it is unnecessary, on an application for surcharge or temporary increase in rates for hot-water heating because of increased operating costs due to abnormal conditions, to make a close ascertainment of plant values, where the evidence showed that a rate sufficient to make proper return on even a low valuation would be so high, under present conditions of operation, as to curtail patronage.

Rate of Depreciation for Central Heating Plants.

On an application for authority to increase rates, by the United Public Service Co. of Rochester, Indiana, the Indiana Public Service Commission fixed an annual allowance of 3% of the value of a heating plant less the value of land, working capital, and

material and supplies, as a proper rate of depreciation. The Commission holds that a heating company, under normal conditions, should be permitted to earn its operating expenses, including taxes, and a sufficient sum to provide for depreciation and a 70% return on the value of its property. But the Commission will not guarantee such a high rate of return during this period of war burdens. The company was confronted by increased coal and labor costs. Increased costs of coal are directly reflected in cost of rendering heating service and to a greater per cent than in other utilities. The Commission therefore found that a temporary surcharge of 30% to all bills for steam heat furnished by the company should be authorized during the period of high operating costs now existing.

Right of Private Heating Utility to Increase Rates.

In a rate fixing proceeding the Maryland Public Service Commission holds, Public Service Commission v. John J. Carlin Heating Co., that a utility organized merely as part of a land development enterprise, while not entitled to the same consideration on an application for an increase in rates as would be accorded an ordinary utility, should nevertheless be entitled to increase rates sufficiently to provide a return approximately equal to the actual cost of furnishing heat.

New Decision on Contractors' Responsibility Under Owners' Plans.

A recent decision of the United States Supreme Court on the subject of the responsibility of contractors under plans and specifications prepared by the owner is commented upon by Charles A. Brodek, Counsel for the Heating and Piping Contractor's National Association, in the association's *Official Bulletin.*

The decision bears out the contention that the contractor is not responsible when there are inconsistencies between the requirements of the plans and specifications prepared by the owner or his architect, or engineer, and the possibility of accomplishing the guaranteed results.

The case quoted is that of U. S. v. Spearing, U. S. Supreme Court, Advance Opinions, January 1, 1919.

Spearin contracted to build a drydock at the Brooklyn Navy Yard in accordance with plans and specifications prepared by the government. The site selected by it was intersected by a sewer which it was necessary to divert and relocate. The plans and specifications provided that the contractor should do the work, and prescribed the dimensions and location of the sewer that was to be substituted. All the plans and specifications were fully complied with by Spearin and the sewer was accepted by the government as satisfactory. Subsequently, while the work of constructing the drydock was in progress, the sewer burst and the construction of the drydock had to be suspended. The government claimed it was Spearin's duty to repair the sewer, whereas Spearin claimed that he had fulfilled his contract, and that it was up to the Government to have it done. The government then annulled his contract for the drydock, whereupon Spearin sued for the work in partially constructing the drylock and for damages.

He recovered and the Supreme Court affirmed that decision, holding that "if the contractor is bound to build according to plans and specifications prepared by the owner, the contractor shall not be responsible for the consequences of defects in the plans and specifications. This responsibility of the owner is not overcome by the usual clauses requiring builders to visit the site, to check the plans, and to inform themselves of the requirements of the work * * *

"The insertion of the articles prescribing the character, dimensions, and location of the sewer implied a warranty that if the specifications were complied with, the sewer would be adequate. This implied warranty is not overcome by the general clauses requiring the contractor to examine the site, to check up the plans, and to assume responsibility for the work until completion and acceptance. The obligation to examine the site did not impose upon him the duty of making a diligent inquiry into the history of the locality, with a view of determning, at his peril, whether the sewer specifically prescribed by the government would prove adequate. The duty to check plans did not impose the obligation to pass upon their adequacy to accomplish the purpose in view."

The principle of this and other decisions is summarized by Mr. Brodek as follows:

THE PRINCIPLE OF THE CASES

An agreement to build in a particular way and to use specific materials in accordance with a design furnished by the owner, which is to be the builder's sole guide, with a guarantee that the work when done in that way will be sufficient for a particular purpose, guarantees the workmanship and material used by the builder ***but does not guarantee the efficiency of the plans furnished by the owner.*** The builder's guar-

antee applies to material and workmanship, but not to the plans, and the contractor is only required to accomplish the guaranteed purpose *as far as the plans and specifications will permit.* A stipulation in a building contract requiring a contractor to produce a certain result by following the owner's plans and directions, *is an undertaking by the owner* that said result can be produced in that way.

WHERE THE PRINCIPLE DOES NOT APPLY

It must be borne in mind that where the contract permits the contractor to deviate from the plans and specifications as the requirements of the job may necessitate, the owner is relieved from his implied undertaking as to the adequacy of the plans and specifications and the contractor is bound.

This is particularly important in relation to the usual guarantee by heating contractors to the effect that the apparatus will heat the building for which radiation is provided, to 70°, when the outside temperature is zero.

If the plans and specifications are prepared by the owner and must be followed by the contractor, then under the principle of the cases to which we have referred, the contractor would not be liable for the guarantee, if materials and workmanship complied with all the requirements of the plans and specifications. There are however, many forms which would make the contractor liable on his guarantee, notwithstanding the fact that the plans and specifications were prepared by the owner.

For example, it is sometimes provided: "The size of the several parts of this apparatus specified herein, or shown on drawings, is to be the minimum size that will be accepted, contractor to increase without charge any parts which may be insufficient to perform the requirements."

Under such a contract, the contractor would be liable to make good his guarantee notwithstanding his compliance with the requirements of the plans and specifications, because those requirements were merely a minimum.

It is sometimes provided: "If, upon making his bid for this contract, the contractor becomes convinced that the radiation or boilers herein called for, are deficient in size, or capacity, he is to figure sufficient size or capacity to make good this guarantee, in which he is to state in his bid how much additional radiation he has figured, and where the same is located. Failing to make such a quotation with his bid, he is understood to accept the amount of radiation and size of boilers as per schedule, and to make good his guarantee, without any additional cost whatever to the owners."

Here also the contractor would be liable, because an opportunity has been given to him by the owner to deviate from the plans and specifications in order to make the plant to fulfill the guarantee.

In other words, where the plans and specifications authorize or direct the contractor to deviate therefrom in order to supply adequate boilers, radiation and piping, the owner no longer assumes responsibility for the plans and specifications, and the contractor must make good his guarantee.

It is needless to add that it is dangerous to apply these principles of construction to any specific contract, without careful consideration of the context and of all remaining provisions.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Secretary Obert Visits Chapters.

Prospective chapters of the heating engineers' society in Toronto, Canada, and in Milwaukee, are reported by Secretary Obert who recently visited these and other points in the society's interests. In Detroit, Mr. Obert met a number of Detroit members, including Past President F. R. Still and W. F. McDonald, who is reported on the road to recovery from his recent illness.

It is announced that 123 additional applications for membership have been received since the annual meeting.

New York Chapter Hears Address on "Superheat."

"Superheat, Its History, Its Theory and Its Use in Chemical and Industrial Industries," was the principal topic for discussion at the March meeting of the New York Chapter, which was held March 20, at the Building Trades Club. The speaker was Alexander Bradley, of the Power Specialty Co., of New York, makers of the Foster superheater. Mr. Bradley read from manuscript and supplemented his address with a number of curves showing the advantages of superheated steam in operating prime movers. He also went into the use of separately-fired superheaters for various kinds of oils and gases in the chemical industry.

Previous to his address, Secretary C. W. Obert told of his recent visit to the western chapters and gave details of the tests being conducted in Detroit by the Michigan Chapter in a school building where

some of the rooms are equipped with cloth screens and the regular heating and ventilating system eliminated in these rooms. They were then compared with other rooms mechanically ventilated. He said the prevalence of influenza and colds in the cloth-window rooms had gone far towards putting a quietus on the advocates of open-window ventilation. Similar activities, he said were going on in Chcago.

Mr. Obert stated that the medical profession was entering into a movement to advocate lower indoor temperatures and higher humidities as a settled policy. One step in this movement is the design of heating plants so that they cannot overheat.

President Walter S. Timmis, of the society announced that the fund for the society's Research Bureau has now reached a total of $17,500, and he stated that the success of the bureau was assured. It was expected that the director of the bureau would soon be announced. Mr. Timmis stated that he was going to Pittsburgh within a few days where some important decisions regarding the Research Bureau were to be made. He also announced that 183 applications for membership in the society had come in since the first of the year, bringing the society's membership up to 1250. The slogan, he said is "2000 members this year" and he urged those present to lend their efforts towards this end.

He called attention to the symposium at the mechanical engineers' headquarters, March 26, on "The Engineer as a Citizen" and announced that William H. Driscoll had been appointed the society's representative to attend that meeting.

The meeting was then turned over by President P. H. Seward to F. L. Fleisher, the chairman in charge of the evening's programme.

Professor Allen Compares Ancient and Modern Building Methods at Meeting of Kansas City Chapter.

Speaking before the local chapters of the American Institute of Architects and of the heating engineers' society, in Kansas City, March 1, Professor John R. Allen, dean of Engineering and Architecture at the University of Minnesota, delivered an address in which he declared, among other things, that the difference in the amount of oxygen our lungs take out of fresh air and impure air is negligible, compared with the effect of ventilation upon the skin. He said he expected to see a practical system developed for revivifying the air after it has been breathed, but for the elimination of odors rather than for supplying oxygen. Odors affect comfort, and comfort is the prime consideration, more than maintaining any definite temperature. Getting temperature and humidity adjusted right brings comfort. We should aim at 40 to 50% of moisture in winter, with 68° or 70° temperature.

Professor Allen stated, however, that he would not build a school house or auditorium without provision for fresh air. Thus he would prevent increase of germ colonies and would provide means for eliminating odors

Private houses, he said, as far as a sufficient supply of fresh air is concerned, admit plenty, as a rule, even when closed tight. Often they need no ventilation at all, certainly no more oxygen is required than what seeps in. The same is true even of houses carefully and tightly built much farther north.

Ventilation or air circulation, where adjustment is necessary, is a thing that must be studied by builders with special attention to each room or inclosure. As a rule, air admitted at the inside walls circulates towards the side with windows. As for retaining heat in a room, householders, by drawing a shade, hold in 20% of the heat otherwise lost through the windows. Drawing a second or double shade saves 40%. Professor Allen had a good word to say for concealed heating equipment and the old Romans were praised for their concealed heating apparatus which, using both water and hot air, were brought to high efficiency. He predicted that the baseboards of our houses may eventually become our heat distributors.

His allusion to the heating systems of the Romans led one of the Kansas City papers to credit Professor Allen with stating that "Roman Architects Excelled Present."

Illinois Chapter to Conduct Tests on Steel Firebox Boilers.

As the result of a discussion at the March meeting of the Illinois Chapter, held at the Chicago Engineers' Club, March 10, the Illinois Chapter will shortly have the opportunity of making a series of tests on firebox boilers of the brickset type and of the non-brickset or portable type. The tests will be carried on at the plant of the Kewanee Boiler Company, Kewanee, Ill.

The March meeting of the chapter was devoted to the subject of "Steel Firebox Boilers, with and without brick settings." A. W. Boylston, chairman of the com-

mittee in charge of the meeting, opened the subject with a prepared address in which he emphasized the efficiency of non-brickset boilers as compared with brick set boilers, the lower cost of installation of the non-brickset type, and the advantage and disadvantages of the two types. On the whole, he believed that the non-brickset boiler compared favorably with the brickset type.

J. P. Dugger also argued for the non-brickset type or portable type of firebox boiler and mentioned especially the comparative ease with which it can be kept clean and in good condition.

Roy Andrews gave some interesting data on air leakage from brickset boilers compared with boilers insulated with various kinds of coverings.

Both August Kehm and George Mehring supported the claims made for the non-brickset type, Mr. Kehm presenting a number of heating plans to illustrate his points, while Mr. Mehring expressed it as his belief that the days of the brickset type of the boiler were numbered.

The offer was then made by Mr. Dugger and accepted by the chapter to set up a firebox boiler with brick setting alongside a firebox boiler of the same type and size, but without brick setting, at the plant of the Kewanee Boiler Company, and to have a test made on them by the chapter itself. He further agreed to give the chapter the services of an engineer and to furnish a sufficient supply of coal for making the test.

Vice-President E. J. Claffey presided at the meeting. Preceding the main business of the evening a report on the progress of the society's Research Bureau was made by H. M. Hart.

Buffalo Chapters Discusses Liquids Used in Themostatic Valves.

A discussion of valves of the thermostatic type, operated by volatile liquids, was the feature of the March meeting of the Buffalo Chapter, which was held March 3. During the dinner, which preceded the meeting proper, pipes were distributed, donated by James A. Donnelly, the speaker of the evening.

President L. A. Harding introduced Mr. Donnelly whose talk was devoted particularly to the recent tests he has been making of various thermostatic valves with a view of determining standard fluids for use with given pressures and temperatures.

Mr. Donnelly showed a chart on which the results of his tests had been plotted, making it possible to select the proper fluid for any given condition.

The liquids tested by Mr. Donnelly and the results obtained are given in the accompanying table:

TABLE SHOWING PRESSURES GENERATED BY DIFFERENT FLUIDS AT VARIOUS TEMPERATURES

	Temperature, Degrees F.								
	212	200	190	180	170	160	150	140	130
Bisulphide Carbon	...	...	...	...	34	28	23	18.5	14.5
Disul. carb. (50 per cent)									
Tetra Chlor. (50 per cent)	...	...	...	31	26	21.5	18	14 5	...
Tetra-Chloride	...	...	26.5	23.5	20.5	17	14	11	...
Carbona	...	31	26.5	22	18.5	15.5	12	9	...
Acetone	...	...	26	22	18	15	11	8.5	...
Thermograde valve fluid	33	28	24	20	17	14	11	8.5	6.5
Gasoline	26.5	20	16.5	13.5	10.5	8	6	4.5	3.5
Wood Alcohol	35	24.5	21	17	13	10	7.5	...	...
Wood Al. (50 per cent)									
Water (50 per cent)	30	19	15.5	12	9	6.5	5	...	...
Wood Al. (33 1-3 per cent)									
Water (66 2-3 per cent)	27	17	14	11.5	8.5	6	...	...	...
Wood Al. (75 per cent)									
Water (25 per cent)	23	16.5	12	9.5	7.5	5.5	4.5	...	...
Fluid used in Sylphon Valve	22	16.5	13.5	10.5	8	6.5	5.5	4	2.5
Rye Whiskey	22	14	8	6.5	4	2	...	...	...
Fusel Oil	18	13	10	7.5	5.5	4.5	3	2	...
Sarco valve fluid (kerosene)	8	6.5	5	4	3	2.5	...	...	...
Vinegar	17	12.5	9.5	7.5	6	4.5	3.5	2	...
Water (absolute pressure)	14.7	11.5	9	7.5	6	5	4	3	2

Eastern Pennsylvania Chapter.

William J. Baldwin, who was scheduled for an address before the Eastern Pennsylvania Chapter in Philadelphia at its meeting, March 10, was prevented from being present, but sent his paper devoted to the early history of the heating industry in the United States. President Walter S. Timmis was present, together with other officers of the society, all of whom addressed the meeting. In addition Former President Stewart A. Jewett reviewed some of the early developments in the history of the heating art and in the society.

Charles V. Haynes was chosen president of the chapter for the ensuing year.

Organization of Boston Chapter

Following the temporary organization of the Boston Chapter of the heating engineers' society, permanent officers have been elected as follows: President, A. S. Kellogg; vice-president, Allen Hubbard; treasurer, William T. Smallman; secretary, Amos C. Bartlett, of the American Blower Company. Directors: the officers and E. D. Densmore and C. F. Eveleth. The chapter starts business again with 18 charter members.

St. Louis Chapter.

Professor E. L. Ohle, of the Mechanical Engineering Department of Washington University, was the principal speaker at the February meeting of the St. Louis Chapter, which was held February 13, in the Board of Education Building. E. S. Hallett, engineeer for the St. Louis Department of Education, also spoke.

Pittsburgh Chapter Holds First Regular Meeting.

The first regular meeting of the Pittsburgh Chapter was held March 5 at the Union Club, preceded by a dinner at the club. Secretary C. W. Obert of the society was present and addressed the meeting. The election of officers was confirmed and a local constitution adopted. The membership committee reported that 25 applications for new members were in hand with a prospect of 15 more. Before adjournment an invitation was extended to the society to hold its summer meeting in Pittsburgh.

The chapter's officers are: President, Professor S. E. Dibble; vice-president, J. E. McGinness; secretary, C. W. Wheeler; treasurer, Paul A. Edwards. Governors: J. B. Walker, F. C. Bartley and P. F. Maginn.

It was decided to hold the next meeting April 26.

Mechanical Engineers Making Research in Heat Transmission.

The presence of George A. Orrok of the American Society of Mechanical Engineers, at the annual meeting of the heating engineers' society, and his plea for closer co-operation between the two societies in the study of heat transfer, calls attention to the fact that important progress is being made, at least in a preliminary way, towards getting new and accurate basic data in this field. Mr. Orrok is chairman of the sub-committee of the Research Committee of the A. S. M. E. on the subject of heat transmission, the other members being Prof. A. T. Wood, Dr. Harvey N. Davis, Dr. Edgar Buckingham and Arthur D. Pratt.

Mr. Orrok said in the course of his remarks before the heating engineers' society:

"Work on the radiator problem is being considered by your society as well as the A. S.M. E., and we shall be able to organize and coordinate this very shortly, as well as the kindred but very different line, that of aeroplane and automobile radiators. The problem of heat transfer under steam-generating conditions is also being organized and work is being done.

"In the condenser and heater field there is yet some unpublished work which will be made public shortly and there are certain physical discoveries to be digested and applied to results already obtained. This work will be undertaken very soon and will be available.

"In numerous other lines work has been laid out, and as fast as the men return from the front to their ordinary lines we shall endeavor to have work started and carried on to a satisfactory end.

"But the main work of the committee, the formulation of an adequate and universal law of the transmission of heat, is, I think, very far off in the future. Dr. Buckingham, I believe, has stated that in the simple problem of the transfer of heat from steam to water through a copper tube there are 26 quantities entering into the equation, most of which are partially unknown or rather imperfectly known.

"In this connection it is well to recall the many experimenters in this field who have worked on the same identical problem with results as diverse as can well be imagined. The fault lay in the apparatus used which had not been arranged with

a view to the elimination of the many unknown factors affecting the transmission of heat. Some of these researches are of value today now that we know how to apply the proper correction factors, but most of them represent wasted effort. Another class of investigations are of little or no value because only such heat was transmitted as was present in the apparatus, the ersult being, of course, limited to this amount. Another class of experiments must be considered as useless since the leakage condition was so bad that no consistent results could be obtained. Let us report all contemplated and undertaken research to the committee, ask advice and avoid duplication."

Activities of National Federation of Construction Industries

In order to keep the building trade better informed of its activities, the National Federation of Construction Industries has commenced the publication of a "News Letter," the first number of which is dated February 25, 1919. Among others actively connected with this association are A. M. Maddock, of Trenton, N. J., who is treasurer; Dr. J. T. Duryea, president Pierce, Butler & Pierce Mfg. Corporation, who is a director; and Charles K. Foster, vice-president of the American Radiator Company, who is chairman of the commercial arbitration committee. Clarence V. Kellogg, president of the Kellogg-Mackay Company, Chicago, is also a member of this committee. Dr. Duryea, besides being a director, is chairman of the export trade conference committee.

In connection with the work of the Committee on Commercial Arbitration it is stated that "business men have long recognized that delay and expense make lawsuits unprofitable. The prompt, though adverse, settlement of a dispute is often of greater value than a favorable verdict obtained after expensive litigation. Differences in foreign trade are now adjusted by commercial arbitration under the auspices of the Chamber of Commerce of the United States. Commercial differences are generally settled in England in this way.

"Differences in the building industry ought all to be so adjusted; they should never go into court. A tribunal of arbitration should be selected in advance in every building center from among capable, experiencd and fair-minded business men, to whom disputes may be voluntarily submitted and decided without regard to technicalities, but with a view solely to substantial justice. Chicago and Philadelphia have taken much interest in this subject and their leading business men are now engaged in a movement for the settlement of all commercial disputes in this manner. A Committee on Commercial Arbitration was authorized."

On the subject of business methods and practice, the stand is taken by the federation that reasonable competition in business life stimulates progress and economy, while undue competition results in loss. It is believed that careful study may disclose methods of improving conditions of business without a violation of the laws against combinations. There is room for education, discussion and voluntary action without crossing the boundaries set by the law and for consideration as to what modifications of existing laws would most improve conditions. A Committee on Business Methods and Practice was authorized.

Other committees that have been formed by the federation are: Committee on Cost Accounting, a Legislation Committee, and a Conservation Committee.

Brooklyn Engineers' Club Hears Talk on Heating.

"Air Return Systems of Steam Circulation," were discussed at length by James A. Donnelly in an address before the Brooklyn Engineers' Club, March 11. In connection with his address Mr. Donnelly had on exhibition a demonstration apparatus, operated by a vacuum pump, showing his new thermostatic valve in action.

Heating and Piping Contractors' Newark (N. J.) Association.

The following officers were elected at the annual meeting of the Heating and Piping Contractors' Newark (N. J.) Association, held in Newark, March 18:

President, John Nellis; vice-president, John G. Keller; treasurer, T. B. Cryer; secretary, Harry Geiser. Executive committee, W. A. Lawson and George L. Dennis.

Following the meeting a dinner was held at the Down Town Club. Among the speakers were the new president, Mr. Nellis, Secretary Henry B. Gombers of the national association; Earnest T. Child, a director of the national association; and Frank K. Chew. The entertainment committee was composed of G. W. Wollenschlager, F. J. Engelberger and T. B. Cryer.

The Architect and the Cost-Plus Fee.

A movement to permit architects to do work on a cost-plus-fee basis has made such progress that it has become the subject of special reports by various organizations of architects. In one report made by a joint committee on reconstruction of the Illinois Chapter, American Institute of Architects, advocating the new practice, it is pointed out that the service rendered by the architect often becomes less a personal service than a use of special knowledge in directing and guiding the labor of a number of others in performing certain service. "The methods employed and included in the term professional practice, with its governing codes, etc., are being approached steadily," continues the report, "by those we have been pleased to call contractors and who have had to do only with the actual business of building."

THE CHANGING CONDITIONS.

For a number of years there has been a gradual increase in and instability of prices for material, and also an increasing scarcity of, and consequent instability in cost of labor, which have rendered the letting of contracts under the old system of lump sum uncertain and unsatisfactory to contractors.

After admitting the faults of the "cost-plus" method and the ease with which this system may be abused, it is nevertheless considered to be the logical solution where labor is insistent in its demands and there is uncertainity as to the character of these demands. It is acknowledged that the system will impose upon architects the checking and auditing of bills, unknown under the lump system, and will greatly increase their work without corresponding recompense. An important admission is made in the statement that "the architect cannot be wholly immune from the effect of changes in business methods in other lines of work akin to his own, which have to do with construction; neither can he ignore the value of public recognition and approval of his services. The fact that construction companies and engineering corporations are employing designers and doing all work from the making of plans and specifications to the construction and furnishing of the building, and that this method is increasing, along special lines, is another element which has the effect of rendering the term architect less known and understood. The prominent part taken by engineering corporations in all government war work is well known. The reason is evident. The public, even the government, does not associate the architect with the actual operations of building in the same way they do engineering and construction companies; the element of design is to it an intangible thing and secondary to the building operation, and is considered a part of such operation, if considered at all. The special fields in which these companies operate are those offering the great opportunities to the architect."

EFFECT OF NEW STATE LICENSING LAWS.

In connection with the new State laws licensing engineers, as well as architects, the ground is taken that this matter should be studied with a view to combination. Under the engineers' law, partnerships with architects are permitted. Corporations cannot be licensed, but under the engineers' law, corporations are permitted to prepare drawings and specifications for buildings and structures which are erected, built or their construction supervised by such corporation, provided the chief executive officer or managing agent of such corporation in Illinois shall be a structural engineer.

Architects are barred from corporations for forming partnerships, except with licensed architects, as far as any provisions to the contrary are found in the architects' license law.

"As architects," states the report, "we are barred from doing in a corporate way what we can do as individuals through co-operative methods." The plea is made that the architects enlarge their sphere of action in this connection without losing their professional status. It is argued that this can be done as there is not an element of contract in the matter as proposed, except for service rendered in planning and supervising construction of buildings. If the owner desires a guaranteed cost, then the architect must resort to the contractor in the old way, but the architect should employ scientific methods in preparing preliminary costs and make his estimates trustworthy.

Effects of Power Plant Supervision by the Fuel Administration.

Interesting details of the way the Fuel Administration's plans for the supervision of the operation of power plants worked out in practice were given by David Moffat Myers, advisory engineer, at the annual meeting of the mechanical engineers' society. Mr. Myers told how in the beginning of the work failure had been pre-

dicted because of the attempt of the fuel engineers to go into a man's plant with the intention of telling him what to do. It was decried, he said, as paternalism. But the results, he declared, showed that with the possible exception of one, all of the States endorsed the procedure of the administrative engineers. Directly after the signing of the armistice, when there was talk of the dissolution of the Fuel Administration, requests poured in from all parts of the country to continue the good work. In reply to these requests a conference was held early in December, 1918, attended by Van H. Manning, director of the United States Bureau of Mines, Dr. Otis Smith, director of the United States Geological Survey, and Dr. H. A. Garfield, United States Fuel Administrator, at which it was decided to merge some departments of the Fuel Administration into the other two Government departments named. For example, the work of the Conservation Bureau, as well as the engineering programme, were to be taken over by the Bureau of Mines.

In conclusion, Mr. Myers asked the engineers to continue to support the conservation movement until the new organization was ready to relieve them of the work.

During the discussion Mr. Meyers was asked whether in his opinion the excellent results achieved in war time were likely to continue after peace has been declared. He was also asked whether the power given the fuel administration to cut off the fuel supply in case there was undue waste, which was not corrected, had any important influence.

Mr. Myers said that in no case had it been necessary to actually cut off the supply because the idea of conservation had met with wide-spread favor, and he believed the good results would continue if means were provided to properly carry on the movement after the war.

Another speaker thought that the questionnaires sent out by the fuel administration should be filled out by every plant in the country and the statistics thus obtained tabulated.

The opinion was expressed that a great deal of the success of the fuel-conservation plan was due to the fact that it reached the owners and managers of plants who ordinarily paid little attention to their cost of power because it represented only a small percentage of the cost of doing business. The companies realized that the best engineering skill was behind the questionnaires, and that the force of the national engineering societies supported the cause. Hence their attitude was more friendly than in the case of a single engineer coming into their plant with the object of improving it to earn a fee.

Submarine Defense Association Announces a New Fuel.

According to an announcement of the Submarine Defense Association, made up of many of the important steamship companies and allied interests, the problem of combining coal with petroleum fuel-oils and with or without coal tars, has been solved. The product is known as "Colloidal Fuel," and is a composite of oil, tar and carbon.

Heretofore, in making an oil-and-coal composite, an insuperable difficulty has been the persistent settling out or sedimentization of the heavy coal and tar particles. This destroyed the value and utility of all mechanical mixtures. Until now the best that chemical science could do, in a practical way, was with the aid of tannin to suspend in oil less than 1% of Atcheson graphite 75 mm. in average size.

Today it is possible to suspend for months in oil 30% to 40% of coal, pulverized so that about 95% passes through a 200-mesh screen. The average size of the coal particles is many times that of the graphite particles in lubricating compounds. It is now possible to combine in a stable liquid fuel about 45% oil, 20% tar and 35% pulverized coal, thereby replacing over one-half of the oil, securing equal or greater heat values per barrel and saving considerable cost.

The new Colloidal fuel, it is stated, has received a most thorough investigation on land and sea. Pulverized coal can now be successfully held in suspension so that the Colloidal liquid flows freely through the pipes, preheaters and burners of ships and power, heating and industrial plants equipped to burn fuel oil.

As an example of the conservation to be affected through the new Colloidal fuel, the report gives an estimate of what would result by its substitution for the 2,900,000 barrels of oil now consumed yearly in the power plants of New England. By displacing only 25% of the oil with pulverized coal, a saving of 675,000 barrels would be secured. Estimates of the cost of this new fuel indicate a valuable reduction in the fuel expenses of New England power plants. Moreover, in New England, graphitic anthracites, gashouse coke and tar, and charcoal can be used effectively. Thus, there may be a marked saving of transportation, 30% as to oil and 30% as to coal.

Regarding the saving of coal involved in

the use of Colloidal fuel, the Submarine Defense Association's pamphlet states:

"For example, with coal at $4.00 per ton and oil at $4.00 per 50-gal. barrel, the saving is $2.00 per ton. This is an average peace condition in New York City."

A demonstration test unit, to manufacture and use Colloidal fuel on land is installed in Brooklyn, New York. The fuel made is burned for power purposes in the works. Further tests, it is stated, will be made at several steel-making plants.

The commercial introduction of Colloidal fuel has been placed in the hands of Lindon W. Bates, chairman of the engineering committee of the Submarine Defense Association in New York.

National Service Committee Organized by Engineering Council.

Announcement is made that a National Service Committee has recently been organized by the Engineering Council, for the purpose of seeking out public services which may be best performed by engineering societies and to offer the proper men for such services, to appear before congressional and government departments, and to supply information to engineers and their organizations regarding pending legislation.

An office of the National Service Committee has been opened in Washington under the management of M. O. Leighton, chairman of the committee, at 502 McLachlen Building, Tenth and G Streets.

U. S. Employment Service Opens Skilled Labor Office.

To assist in bringing the skilled man and the "skilled" job together, the U. S. Employment Service, Department of Labor, has opened a practical demonstration office, the first of its kind in the country, at 1184 Broadway, New York. Here are being applied the latest and most approved methods of interviewing and placing skilled workers from the army, navy and war work plants, scientifically matching the man and the job.

In its professional and special section the Employment Service has recently extended the scope of its work by the establishment of two new zone offices of the Professional and Special Section, in Philadelphia and Boston, and it plans to establish other offices of this section in the near future. The new zone offices are in addition to the two main offices at New York and Chicago, and will serve the particular zones in which they are located.

Employers requiring the services of educated and experienced men, are asked to state definitely the nature of the positions available, to the nearest of the following U. S. Employment Service Professional and Special Section offices:

New York office, 16 East 42nd Street; Chicago, 62 East Adams Street; Philadelphia, 1518 Walnut Street; Boston, 16 Tremont Street.

Winter Weather of 125 Years Ago.

The claim that the climate in this country is changing and that the winters are not what they used to be has received a rude setback by the publication of the meteorological observations for January, 1794, which were recently published in the New York Globe, being taken from a copy of the *American Minerva* for Saturday, February 1, 1794. We are indebted to William H. Driscoll, chief of the heating and ventilation division of the Thompson Starrett Company, New York, for the clipping, which is as follows:

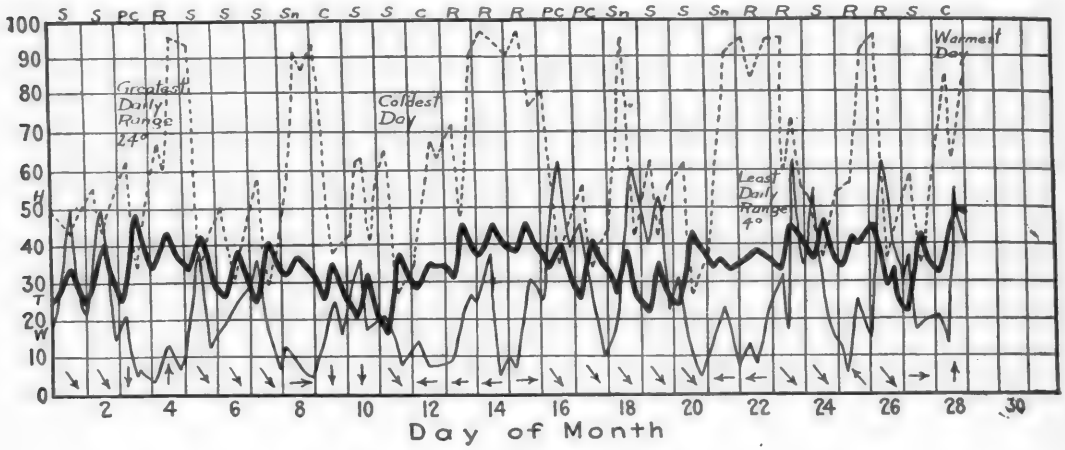
	Degrees
Mean temperature by Fahrenheit at 8 a. m.	28.6
Mean temperature by Fahrenheit at 2 p. m.	35.3
Mean temperature by Fahrenheit at 9 p. m.	31.4
Mean temperature for whole month	31.7
Thermometer under 32 degrees (freezing point,) during month	21 days
Coldest days, 12th and 25th	17
Warmest day, 10th	51
Greatest monthly range	34
Greatest range in twenty-four hours, on the 13th	15.3
Fair days during month	20
Rainy days during month	6
Snowy days during month	3
Days when wind was between north and west	11

In commenting on the data Mr. Driscoll states: "You will note that the mean temperature for the month was 31.4 degrees, which compares very closely with the mean average for January during the past forty years."

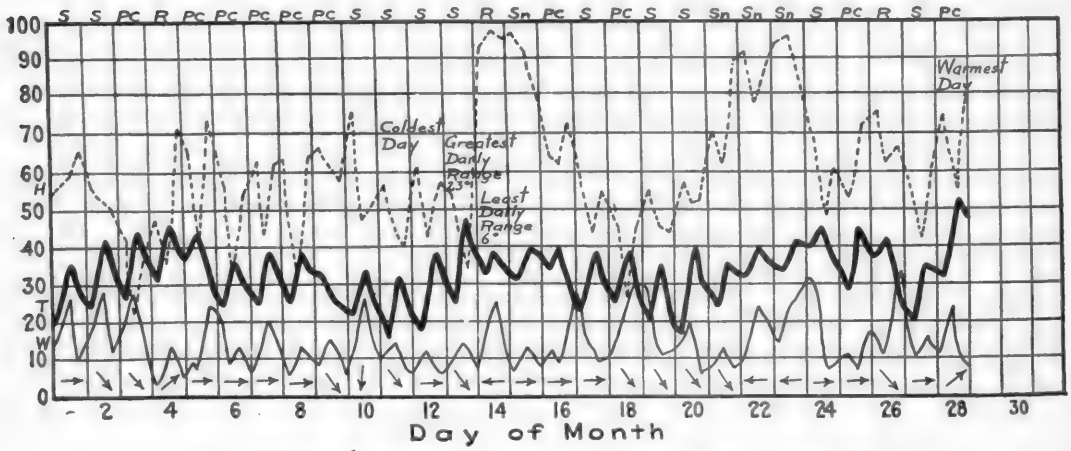
A. M. Feldman, New York, who has been engaged in war work in Washington, has returned to his practice as consulting engineer for heating and ventilation. Mr. Feldman's office is now located at 145 West 45th Street, New York, and he desires to receive manufacturers' catalogues.

THE WEATHER FOR FEBRUARY, 1919

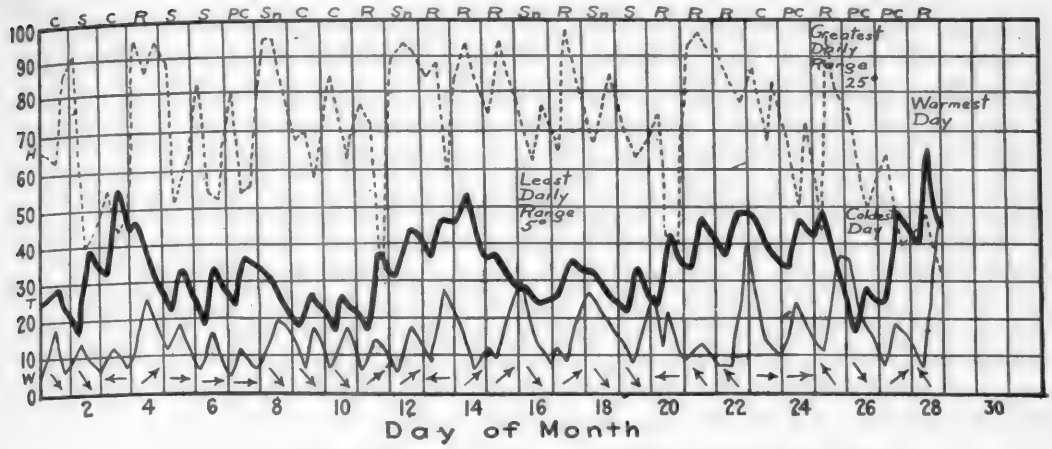
	New York	Boston	Pittsburgh	Chicago	St. Louis
Hightest temperature, degrees F	51	52	65	52	59
Date of highest temperature	28	28	28	3	11
Lowest temperature, degrees	16	16	17	11	16
Date of lowest temperature	11	11	26	26	9
Greatest daily range, degrees F	24	23	25	32	33
Date of greatest daily range	3	13	25	28	28
Least daily range, degrees F	4	6	5	2	5
Date of least daily range	22	14	16	21	14
Mean temperature for month, degrees F	34.7	33	34	30.5	36.7
Normal mean temp. for month, degrees F	30.7	28	31.8	25.4	33.5
Total rainfall, inches	3.45	2.66	1.58	2.78	1.54
Total snowfall, inches	0.70	6.2	1.7	6.6	3.1
Normal precipitation, this month, inches	3.74	3.44	2.66	2.16	2.75
Total wind movement, miles	13275	7986	8139	8583	10403
Average hourly wind velocity	19.8	11.1	12.1	12.8	15.5
Prevailing direction of wind	N. W.	N. W.	N. W.	N. W.	N. W.
Number of clear days	12	11	4	8	13
Number of partly cloudy days	4	13	4	6	7
Number of cloudy days	11	4	20	14	8
Number of days on which rain fell	13	3	10	8	6
Number of days on which snow fell	3	4	4	7	2
Snow on ground at end of month	None	None	None	Trace	None



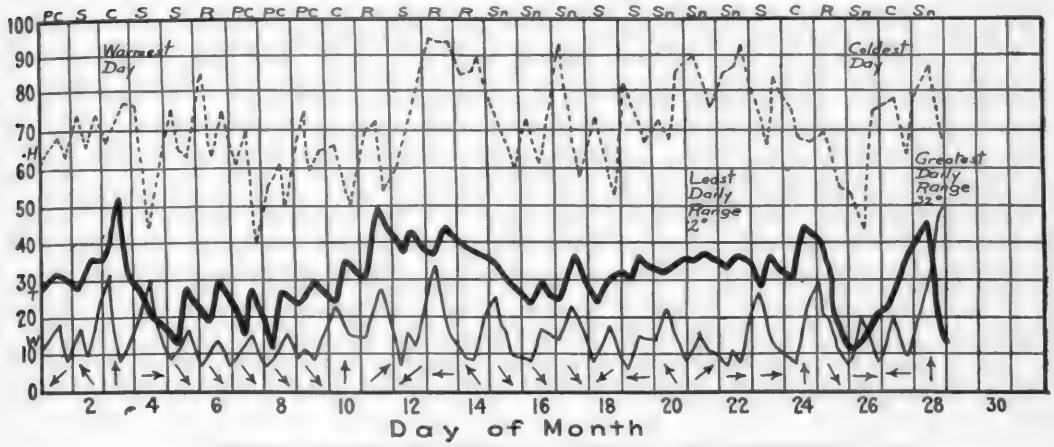
RECORD OF THE WEATHER IN NEW YORK FOR FEBRUARY 1919.
Relative Humidity Curve Plotted from Hourly Readings.)



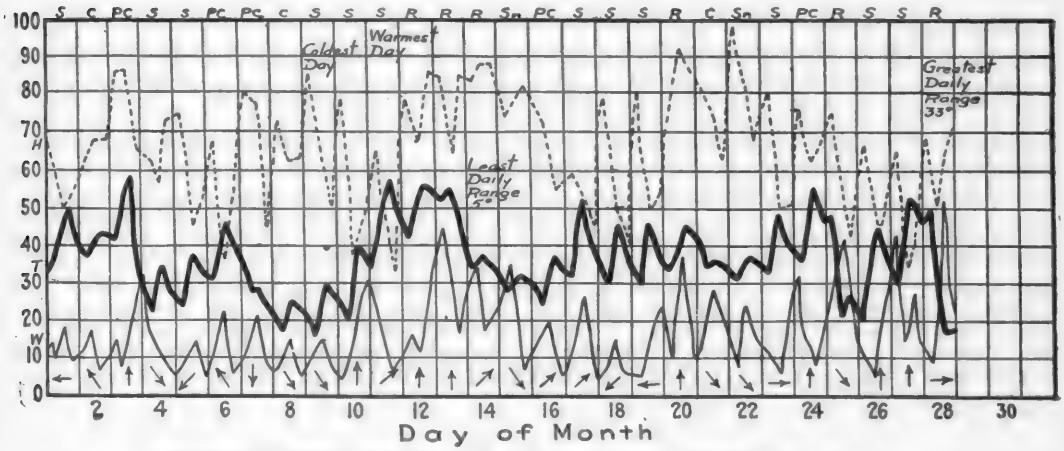
RECORD OF THE WEATHER IN BOSTON FOR FEBRUARY, 1919.



RECORD OF THE WEATHER IN PITTSBURGH FOR FEBRUARY, 1919.



RECORD OF THE WEATHER IN CHICAGO FOR FEBRUARY, 1919.



RECORD OF THE WEATHER IN ST. LOUIS FOR FEBRUARY, 1919.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicates temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in per centage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

Another Engineering Brochure Containing Manufacturers' Advertisements.

Under the title of "Engineering," a remarkable publication has reached us featuring the extensive practice of the combined firms, the Charles L. Pillsbury Co., of Minneapolis and St. Paul, and Vaughn & Meyer, of Milwaukee and Wausau. This book admirably shows the scope of the activities of this engineering organization and brings out the numerous ways in which a consulting engineering organization can serve its clients.

In a reference to its policies the firm states that in these days of "free engineering service," which manufacturers and distributors of appliances, equipment and materials extend to prospective users, the laymen is only too prone to regard the services of an ethical and capable organization as a useless and unwise expense. Frequently, it is only after he finds himself so confused by the multiplicity of solutions, suggestions and recommendations, that he finds himself unable to make correct decisions and, generally, it is then too late to receive the full advantages of consultant services for the particular object in hand. In that event, he can only promise himself and us that he will act more wisely "next time," which time seldom arrives. Largely because of these conditions, it is claimed, there are many projects that represent stupendous investments which are withal quite inefficient.

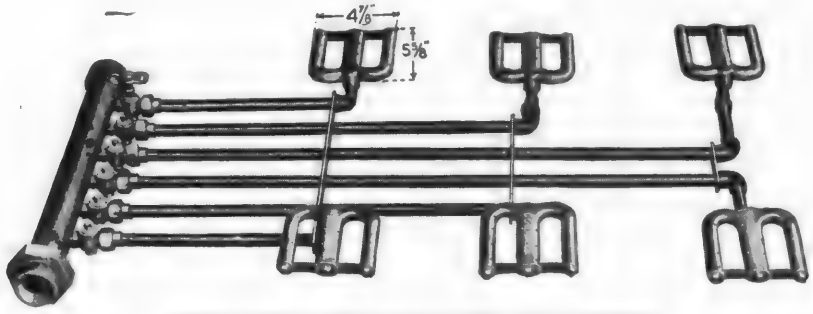
It is also attempted in this brochure to definitely place in the prospective client's mind the true position of the consulting engineering organization with refernce to the various elements involved in carrying forward any piece of constructive work. The work of the ethical engineering organization for co-ordinating the innumerable factors and activities which enter into all great work that spell human progress is of the utmost importance and it is largely through the efforts of such organizations that these problems are conceived in their entirety and solved with thorough attention to the various details which are so vital in assuring the ultimate efficiency and success of such engineering works.

The brochure, handsomely gotten up and supplemented with many illustrations of the combined companies' facilities, together with examples of installations and of their methods in general, is seriously marred by the appearance of advertisements of manufacturers in this field. No doubt without intending to do so, the firms responsible for the brochure have laid themselves open to a charge of infringement of good business ethics which, of course, are of equal importance to the maintenance of good professional ethics.

It is well known that the promotion of this type of trade literature is a scheme of promotors who undertake to publish it without charge to the engineer in return for the advertising privileges. It is easy to see the pressure the promotor is able to exert upon the manufacturer especially when, as is often the case, he is permitted to use the influence of the engineer in soliciting patronage. This practice has already been a subject for comment in these columns. It was thought that it had been definitely stopped and it is disquieting to a degree to find reputable firms of the class here mentioned participating in this method of advertising.

Twin-Unit Type of Barber Gas Burner.

Supplementing the description published last month of the Barber patented gas burners, adaptable to domestic heating furnaces and requiring no mechanical air-mixing device, the accompanying illustration shows the construction of the twin-unit type which is arranged on a 1½-in. special manifold, for the coal-burning type of boiler. This burner is guaranteed to burn at atmos-



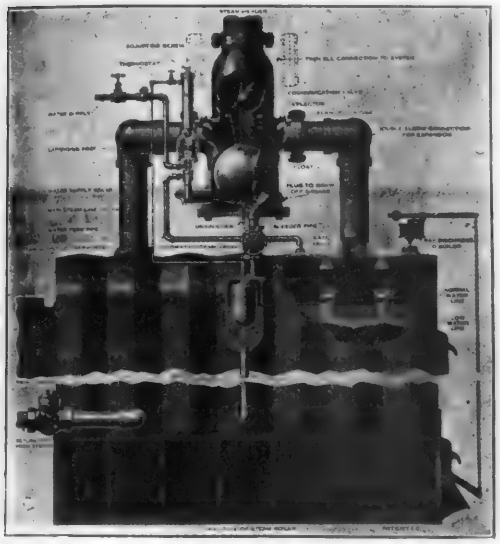
TWIN-UNIT TYPE OF BARBER GAS BURNER.

pheric pressure and, it is stated, will not deposit carbon at a pressure above one-fourth of an ounce.

The Kelly Controller for Steam Boilers.

An appliance designed to control the water in a steam boiler and, for that reason, called the "boiler master," has been brought out, under the name of the Kelly controller, and is being marketed by the Kelly Controller Co., now located at 175 West Jackson Boulevard, Chicago. This appliance, it is stated, performs the functions of a steam header, bleeder, grease separator, velocity reducer, automatic water feeder and emergency temperature reducer.

The pipes connecting the Kelly controller are full size of boiler tappings. Leaving the boiler, steam is forced downward by deflectors into a chamber, reducing the velocity and separating the water from the steam. A bleeder pipe connects the controller to the bottom of the boiler, so that only dry steam passes into the



KELLY STEAM BOILER CONTROLLER.

system above. When any slight priming or surging occurs, the water falls by gravity into the controller chamber and returns to the boiler through the bleeder pipe.

When an excess of water accumulates in the chamber, due to priming, the float rises, closing the communication valve, thus cutting off connection with the system above. The float on rising lifts a lever which opens an auxiliary water supply valve. The water is discharged into the boiler in the form of a spray, reducing the temperature of the overheated surging water, serving as a temperature reducer. The communication valve, it is pointed out, is not affected by a vacuum or pressure, its action depending entirely on the rising of the float.

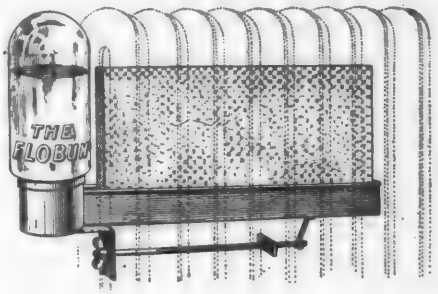
The water feed attached to the controller is optional, although its use is advocated. When the water in the boiler drops below a certain level, the float in the casing on the bleeder pipe lowers, allowing steam to pass through a 1¼-in. pipe up to the thermostatic valve. This valve, on expanding, forces the disc on the water valve open, allowing the injection of water, filling the boiler to the desired level. When that level is reached, the rising of the float shuts off the steam to the thermostatic valve. The dead weight of the float closes the water valve.

With this appliance swing check valves must be used on the return pipes so that excess pressure in the boiler caused by closing the communication valve will not permit the water to be forced up into the system.

The device has been tested for some time under the name of the Kelly priming device. It is the invention of P. J. Kelly, of Chicago.

Trade Literature.

FLOBUN HUMIDIFIER, intended to be attached to a radiator, and which operates by feeding water by siphonic action from a sealed, air-tight container into a metal trough, containing a composition which draws the water from the trough by capillary action, is a new device brought out by the Minneapolis Heat Regulator Co., Minneapolis, Minn., and featured in newly-issued circular matter. The wick has a large evaporating surface and contains no vegetable matters to foul and smell. The wick is located between the coils of the radiator where it is intended most effectively



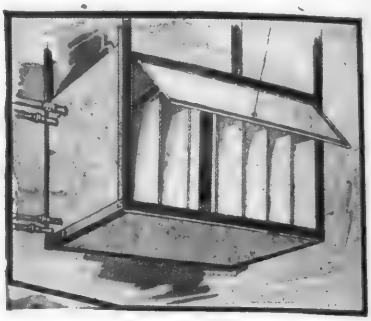
FLOBUN HUMIDIFIER.

to continuously evaporate the water into the room. It is stated that the Flobun humidifier will evaporate from 2 to 4 gal. per day on the average radiator.

WESTINGHOUSE NEW ANNUAL CATALOGUE has been issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., with listings of its entire line of electrical supplies. The catalogue is made up of 1264 pages of description pertaining to the company's products, while a score of other pages contain a complete cross index, index to style numbers and a table of "approximate cost multipliers," which enable one to figure the approximate cost of all supplies. Although designated as a catalogue, this publication contains a large amount of information of a technical and engineering nature. Practical suggestions are given for the use of many kinds of apparatus for the transmission and utilization of electric power. It is planned to issue the catalogue annually.

D-I STEAM HEATING, VENTILATING AND HUMIDIFYING SYSTEM, 1919, is the title of a new catalogue, devoted to the products of C. C. Shipp & Co., Indianapolis, Ind. These include ventilating wall-box outfits, foul-air ventilating flues, aspirating radiators for foul-air ventilating flues, foul-air vent registers, foul-air collecting chambers and automatic foul-air ejectors. All of these appliances are illustrated. The catalogue also contains copious extracts from the report of Professor C. B. Veal on heating and ventilating systems for school houses which appeared in THE HEATING AND VENTILATING MAGAZINE for July, 1917. Size 8½x11 in. Pp. 24.

ILGAIR UNIT SYSTEM OF HEATING, described as the economical solution of the problem of heating spacious industrial plants, is the subject of an interesting circular issued by the Ilg Electric Ventilating Co., Chicago, Ill. This system embodies the use of the Ilgair unit heater, which is a cabinet, open at both ends, in which is housed an ordinary two-stack radiator and an Ilg self-cooled motor propeller fan. This cabinet acts as a heating chamber for the air which is drawn over the heated coils on the intake side at a low velocity, about 1000 ft. per minute and discharged in volume at high velocity, about 2500 ft. per minute. The heat, it is pointed out, is controlled at its source, by means of a stationary deflector which serves to spread the air in a horizontal plane, while a movable deflector controls the placement of the air. As the breathing line warms up, the deflector is raised, allowing the current of air to straighten out, easily reaching, it is stated, a distance of 50 to 60 ft. As the adjustable deflector holds the circulation of air near the floor, the number of heating units required depends entirely on the floor area and not on the height of the ceilings. In practice it has been found that Ilgair unit heaters handling 15,000 C. F. M. with about 650 sq. ft. of radiation will maintain a temperature of 68° F. over 10,000 sq. ft. of floor space, irrespective of ceiling height. In connection with the operation of these heaters an example is given of a building 166 ft. long and 60 ft. wide, covering about 10,00 sq. ft, which can be satisfactorily heated with five No. 20 Ilgair unit heaters handling 15,000 cu. ft. perm inute, using but 1½ H. P. To heat this same space with a standard blast system would require, it is figured, about 10 H. P. It is also pointed out that these units can be used in summer as cooling outfits. Among the firms which have installed Ilgair unit heaters are the Universal Engineering Co., Maywood, Ill.; Ford Motor Co., Detroit; Henry Ford & Co., Tractor Plant, Dearborn, Mich.; Trus-Con Steel Co., Youngstown, O.; Ryan Cooperage Co., Chicago; Philadelphia Storage Battery Co., Philadelphia; Cincinnati Abattoir Co., Cincinnati; Kerr Bleachery, Concord, N. C.; and the Edwin Mitchell Co., Medford, Mass.

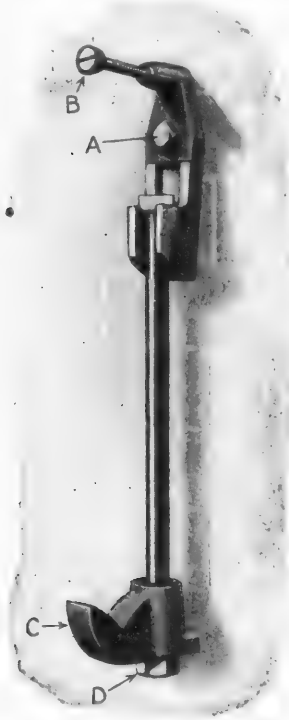


ILGAR UNIT SYSTEM OF HEATING, CEILING SUSPENSION TYPE.

COLUMBIA RECORDING THERMOMETERS, "for the accurate recording of all temperatures not exceeding 1000° F." is the subject of a handsomely-compiled catalogue featuring the product of the Schaeffer & Budenberg Co., Brooklyn, N. Y. The company's policy, it is stated, is that "no instrument is allowed to leave our factory until we are satisfied beyond all doubt that it is properly designed, made and tested to go into service and do its work properly." In addition to illustrated descriptions of the various types, there are views of a number of typical installations showing the wide adaptability of these instruments. The various features of

construction are taken up at length, special attention being directed to the patented acid and moisture proof insulating covering for the flexible steel connecting tube and to the removable, adjustable and compensating recording arm. The Columbia recorder, it is added, may always be recognized by its "day and night" border chart. Listings are included of the various Columbia and Scheffer charts. Size 8 x 10¼ in. Pp. 301-362, being Catalog Section No. 300 (punched for loose-leaf binding).

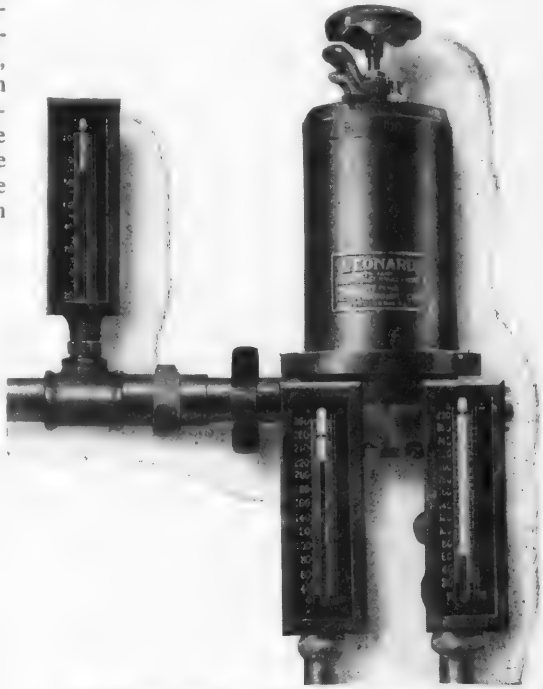
G. F. E. ADJUSTABLE WALL RADIATOR BRACKET, described as easily and readily installed, requiring only one hole for support into which is inserted a 5/8-in. bolt, is brought to the attention of the trade in a circular issued by the General Fire Extinguisher Co., Providence, R. I. The radiator rests upon the foot, C, and the top is held in place by the screw, B. The foot, C, can be raised or lowered with



NEW TYPE OF ADJUSTABLE WALL RADIATOR BRACKET.

or without the radiator in place, by turning the nut on the bolt, D, thereby making it easy to adjust the radiator to allow for proper drainage. This adjustment makes possible the setting of each foot so that each will bear its proportionate weight of the radiator. The bracket is practically invisible when the radiator is set in place.

LEONARD VALVES, for water temperature control, are presented in a catalogue issued by the Leonard-Rooke Co., Providence, R. I. While these valves are designed especially for showers and batteries of showers, they may be used where a predetermined temperature of a mixture of cold and hot water is desired. In operation the combined temperature causes the thermostat to automatically adjust two sets of balanced valves which allow the correct amount of hot and cold water to pass into the valve

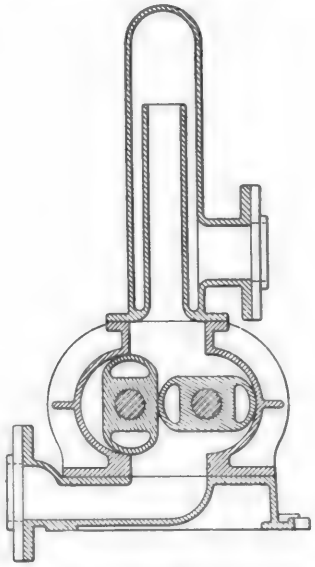


LEONARD MIXING VALVE FOR CONTROLLING TEMPERATURE OF HOT WATER SUPPLY.

in order to maintain the temperature called for by the pointer on the temperature scale. It is stated that changes in the supply temperatures or pressures does not affect the temperature of the water delivered from the valve. Size 7½ x 10½ in. Pp. 28.

ROOTS ROTARY VACCUM PUMPS, for return line vacuum heating system, described as simple, quiet, rugged, low in cost, efficient and durable, are covered in a circular published by the P. H. & F. M. Roots Co., Connersville, Ind. These pumps are designed to remove air and condensate from the system while maintaining a vacuum of 10 in., returning the hot water to the low-pressure boiler. The straight line type of impeller, it is stated, which is exclusively used in these pumps, is the

basic cause of their efficient, noiseless operation. In addition to complete tables of sizes and capacities, a diagram of piping details is included, which will be of



CONSTRUCTION OF ROOTS ROTARY VACUUM PUMP AND AIR CHAMBER.

value to the architect or heating contractor when laying out piping in connection with the Roots rotary vacuum pump and air-separating standpipe.

FRIGIDAIRE, described as the modern frigerating essential, designed for use in household refrigerators in place of ice, has been brought out by The Frigidaire Corporation, a division of the General Motors Corporation, Detroit, Mich., and is described in newly-issued catalogue matter. While the device has been in use for some time, it has not until recently been marketed on an extensive scale. The general appearance of the cooling apparatus may be seen from the accompanying illustration. An electric motor is used to compress and circulate the cooling medium.

Deaths.

GEORGE L. BOTTUM, president of the Bottum Valve Co., Chicago, died at his home in that city, February 17 after an illness of several weeks. Mr. Bottum was the designer of the Bottum radiator valve which has been on the market several years, and had a large acquaintance in the heating trade with which he had been identified for over 40 years. He leaves a widow, two sons and three daughters.

C. R. WISE, president of J. B. Wise, Inc., Watertown, N. Y., manufacturers of brass goods, died at his home in that city February 26, of pneumonia. Mr. Wise was 37 years old. He became president of the company on the death of his father, J. B. Wise, three years ago and had had charge of the company's affairs during its unusual growth in that period. He leaves a widow, mother and one brother.

JAMES T. SHEAHAN, district sales manager of the American Radiator Company, died in Kansas City, Mo., March 14, of pneumonia. He was 42 years old. Mr. Sheahan started to work for the American Radiator Company when he was 15 years old and advanced to the position of district sales manager for the West. He had just changed his headquarters from Seattle to Kansas City in order to more closely supervise the branches in his charge which were Kansas City, Omaha, Denver, San Francisco, Portland, Seattle and Los Angeles. He leaves a widow and five children, also a sister and two brothers.

LAURENCE FRANKLIN, son of the late Albert B. Franklin of Boston, and treasurer of the Albert B. Franklin Co., heating and ventilating engineers of that city, died at his home in Melrose, Mass., March 4. He was 40 years old. Mr. Franklin underwent a minor operation recently. Blood poisoning resulted and later pneumonia developed, which caused his death. With his brother, Ralph, Mr. Franklin succeeded to the business of his father, who died a few years ago. The concern is one of the oldest and most important of its kind in New England.

Correction on Data Sheet 128-B.

EDITOR HEATING AND VENTILATING MAGAZINE:

Referring to the March issue of your magazine, I wish to call attention to Data Sheet No. 128-B, published in that issue. I am very familiar with this table which has been in private use for several years. There is an error in the last two columns. The column headed "3000" should read "2500," while the column headed "3500" should read "3000." It may be interesting to know that these tables were made up from Peabody's steam tables, which have now been superseded by Marks' and Davis' tables.

Washington, D. C.

R. G. E.

These errors will be corrected on the sheets as separately printed.—ED.

As you were proud of your Service Flag —now win a Victory Loan Honor Flag

YOUR Service Flag hung proudly in the factory or office. It meant to you and to everyone that saw it the response of your organization to the nation's call for men.

The true greatness of that response was in the way the country accepted conscription. The whole people was ready to fight if need be.

Conscription for the Victory Loan is impossible, and undesirable, but fundamentally the cases are the same.

The draft could not have succeeded had public opinion not approved it, and the Victory Liberty Loan cannot succeed in the true sense unless the whole population supports it.

The Industrial Honor Flag is evidence that the required per cent. of your employees—in factory, office or shop—have subscribed to the Victory Loan. It doesn't matter how much, so far as winning the flag goes; the object is to get hold of everybody and make the Victory Liberty Loan a completely national thank offering.

For us it was a short, intensive war, happily far more costly in money than in lives. Germany crumbled just as we got ready to fight with real effect. Now the bloodshed has ceased, but there remain bills to pay.

The Victory Liberty Loan will enable the Treasury to pay the country's outstanding bills. It is a patriotic duty, a thanksgiving for peace and victory, and a sound saving scheme, to subscribe to the Victory Liberty Loan.

Are YOU going to win that Honor Flag?

LIBERTY V LOAN

"The Clean-up" Button

Victory Liberty Loan

Space contributed by

The Heating and Ventilating Magazine

Prepared by American Association of Advertising Agencies cooperating with United States Treasury Department

BOILER HORSE-POWER.

A flue boiler will evaporate 2 lbs. of water per hour per square foot of heating surface. Now, as the evaporation of 30 lbs. of water per hour into steam of 70 lbs. gauge pressure, when feed water has a temperature of 100° F., constitutes a horse power, then each 15 sq. ft. of heating surface in this type of boiler, with good coal and good draft, will generate a horse-power.

Tubular and water-tube boilers can be made to furnish a horse-power for each 12 sq. ft. of heating surface. Locomotive boilers will develop 1 horse-power for each 8 sq. ft. of heating surface. Under average conditions, with feed water at 100° F., and steam at 70 lbs. gauge pressure, and 3,000 lbs. of water evaporated in one hour in any boiler above mentioned, then $3,000 \div 30 = 100$ horse-power developed by that boiler. In actual practice, however, the conditions must be reduced to the standard given, as follows:

Rule—Multiply the total heat of steam at pressure carried (minus temperature of feed water) by the pounds of water evaporated per hour and divide by 33,000 B. T. U. The quotient will be the pounds of water evaporated with feed water at 100° F., and a steam pressure of 70 lbs.

Problem—The steam pressure being 90 lbs. and feed water 210° F., and 3,400 lbs. of water being evaporated per hour, what is the horse-power? Referring to steam table we find that 90 lbs. gauge pressure (or 105 lbs. absolute pressure) contains 1,182° above 32° or $1,182 + 32 = 1,214$. Then $1,215 - 210 = 1,004°$, and $1,004 \times 3,400 = 3,413,600$. This $\div 33,000 = 102$ H. P. which would have been evaporated under standard conditions with the same amount of heat.

The horse-power of boilers is best defined by the heating surface of a boiler and is different according to its construction. A tubular boiler will give one horse-power to every 15 sq. ft. of heating surface; a flue boiler every 12 sq. ft.; with a cylinder boiler 10 sq. ft. gives one horse-power. There is no standard law governing the horse-power of steam boilers, but this rule is adopted by most experts as a fair rating.

One cubic foot of water evaporated per hour = 2 nominal horse-power.

7½ lbs. of coal consumed per hour will evaporate about 1 cu. ft. of water = 2 horse-power.

1 sq. ft. of grate will consume on average 12 lbs. of coal per hour = 3.2 H. P.

ENGINE HORSE-POWER.

All calculations to find the horse-power of an engine are necessarily only approximate, as they are modified more or less by the factors of friction in the moving parts, condensation, quality of lubricants, amount of load, etc.

The unit of power is the horse-power, and was first calculated by Watt, the prince of inventors in steam enginery; after numerous experiments, Watt estimated the power of a good, average draft horse to be that which could lift 33,000 lbs. one foot high in a minute, 550 lbs. in one second, or 1,980,000 lbs. in an hour. Hence, we have the horse-power factor, 33,000 lbs.

RULE TO FIND HORSE-POWER OF AN ENGINE.

Area of piston in inches multiplied by pressure per square inch, multiplied by speed of piston in feet per minute, and that product divided by 33,000.

$$\text{H. P.} = \frac{\text{P L A N}}{33{,}000}$$

P = Pounds pressure per square inch.
L = Length of stroke in feet.
A = Area of piston in square inches.
N = Number revolutions per minute.

The pressure per square inch should be the mean pressure throughout the stroke exerted on the piston, which can be found by attaching an indicator to the engine. The result will be what engineers term indicated horse-power.

For the net effective horse-power, deduct from the above about one-quarter for friction of the working parts.

When the indicator is not used, and in the calculation the boiler pressure is substituted for the mean effective pressure, deduct from the result obtained from 40% to 60% for loss by condensation and friction of steam in pipes and passages, decrease of pressure in cylinder due to expansion, back pressure of exhaust, and friction of the working parts.

For engines from 20 to 60 H. P., an average of 50% may be deducted; for smaller engines more.

The mean pressure in the cylinder when cutting off at

1/4 stroke equals boiler pressure multiplied by 0.597
1/3 stroke equals boiler pressure multiplied by .670
3/8 stroke equals boiler pressure multiplied by .743
1/2 stroke equals boiler pressure multiplied by .847
5/8 stroke equals boiler pressure multiplied by .919
2/3 stroke equals boiler pressure multiplied by .937
3/4 stroke equals boiler pressure multiplied by .966
7/8 stroke equals boiler pressure multiplied by .992

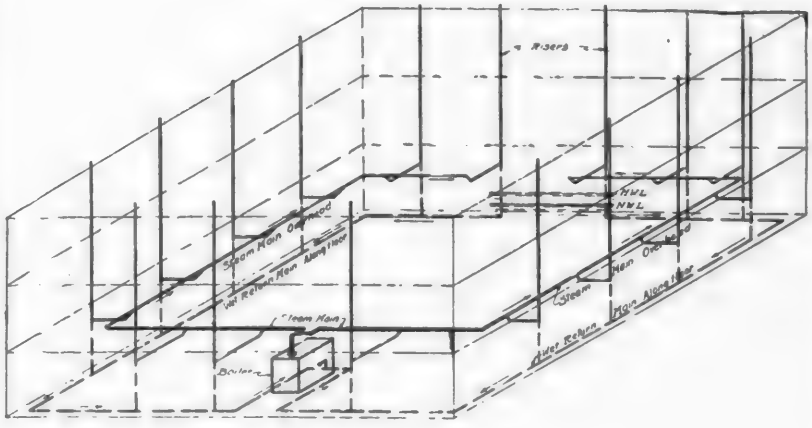
CAPACITY OF STEAM MAINS IN SQUARE FEET OF EQUIVALENT DIRECT RADIATION.

For a Total Pressure Drop of ½ Lb.

Length of Run. Feet.

Size of Pipe, In. Diam.	100	200	300	400	500	750	1000	1250	1500
	Square Feet of Equivalent Direct Radiation.								
¾	56	40	32						
1	126	92	72	64	56	44	40	36	
1¼	232	166	136	118	100	86	74	66	60
1½	388	274	216	188	172	142	122	110	102
2	854	632	528	456	414	350	294	260	246
2½	1490	1020	850	720	676	564	480	420	386
3	2700	1900	1420	1320	1174	964	880	840	700
3½	3860	2740	2200	1910	1760	1404	1264	1120	1020
4	5400	3800	3120	2680	2420	1970	1760	1550	1440
4½	7240	5100	4160	3580	3240	2630	2320	2100	1930
5	9600	6820	5580	4800	4340	3510	3120	2810	2560
6	15450	10920	9000	7700	6800	5650	5060	4500	4080
7	22560	16200	13100	11200	10000	8150	7160	6600	5860
8	31600	22500	18300	15750	14040	11400	9550	8850	8440
9	42200	30900	23900	21100	19000	14500	13200	11800	10950
10	56200	40800	32700	28100	25300	20500	17900	16200	14750
12	91200	63200	51500	44600	40000	32300	27800	25400	23600
14	119500	84400	66600	57600	51200	41400	36200	33000	30000
15	140420	98800	80000	68200	61000	49800	42800	38800	35800
16	167500	119500	98500	85000	75800	59800	53200	48000	43600
18	227000	187000	130500	112500	101000	82800	71600	64000	59000
20	280000	200000	162000	140400	126600	102500	88500	81000	73000

ONE-PIPE RELIEF SYSTEM.

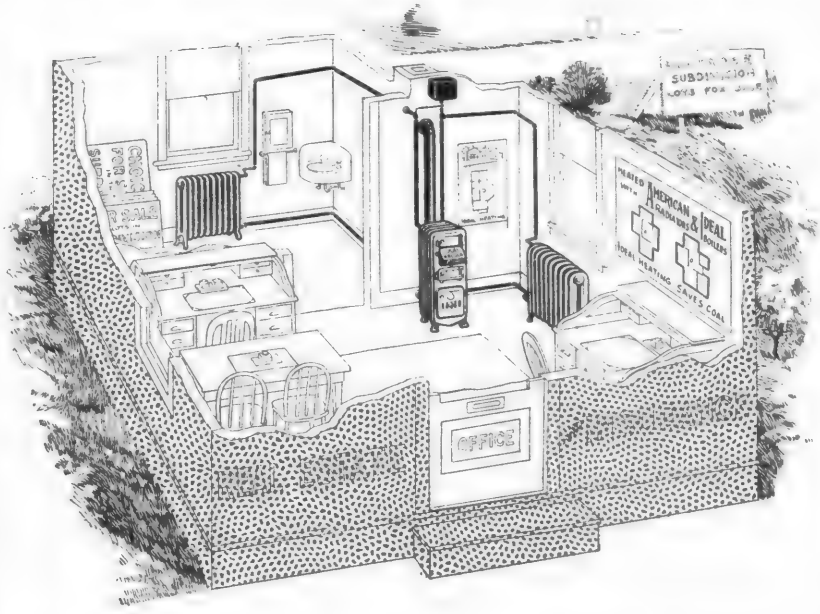


For larger jobs, where the area is considerable, but the height of the building low, a system termed the "one-pipe relief" system is used. This is shown in the illustration and consists of a steam main run around the basement ceiling, pitched with the flow of steam. Every riser in this scheme is dripped at the bottom and is supplied by a runout taken from the bottom of the steam main so as to drip the main at every riser connection. Thus the steam main does not carry any condensation from the radiators, and has its own condensation dripped at frequent intervals.

The return mains for the "one-pipe relief" system are usually run along the walls near the floor and as nearly under the risers as practical. The return should be a wet return, but if a dry return is absolutely necessary the drips should all be water-sealed before connecting thereto.

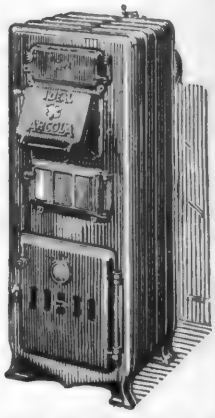
IDEAL Arcola Hot Water Heating Boiler

For cellarless small houses and flats



This illustrates the simplicity of installation of an IDEAL Arcola Boiler and two AMERICAN Radiators in a cellarless small office building. The piping is, of course, ordinarily run out of sight, within walls or partitions.

The architect has in the IDEAL Arcola a most satisfactory solution of the individual heating demands of his factory and community housing plans. In general purpose like a stove, heating the room in which it is placed, but unlike a stove, providing circulating hot water for radiators in adjoining rooms. Great fuel saving, together with the desirable and equitable warmth of Hot Water Heating, is secured.



The IDEAL Arcola is both a Boiler and a Radiator

Write today for special literature illustrating and describing the IDEAL Arcola

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

TRADE AND MISCELLANEOUS NOTES

Coming Events

June 11, 1919.—Annual convention of the National Warm Air Heating and Ventilating Association, in Columbus, O. Secretary, Allen W. Williams, Columbia Building, Columbus.

June 10-12, 1919.—Summer meeting of The American Society of Heating and Ventilating Engineers in Pittsburgh, Pa.

June 10-13, 1919.—Annual convention of the National District Heating Association, in Pittsburgh, Pa.

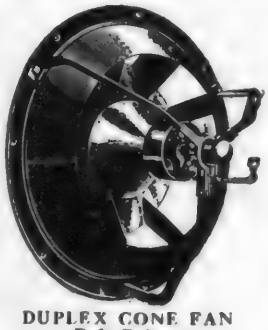
June 12-14, 1919.—Annual convention of the Heating and Piping Contractors' National Association (formerly National Association of Master Steam and Hot Water Fitters) in Atlantic City. Headquarters at the St. Charles Hotel.

June 17, 18 and 19, 1919.—Annual convention of the National Association of Master Plumbers in Atlantic City, N. J. Headquarters at the Hotel Breakers.

Miscellaneous Notes.

Eastern Supply Association reported the largest attendance on record at its winter meeting in New York, February 12, at the Hotel Astor. The speaker of the day was Dr. Robert M. McElroy, who discussed the reconstruction period and what it means to America. William J. Woolley told of the revival of the work of the Trade Extension Committee and of its plans for the future. Other speakers were John T. Brown, Jr., who discussed "Credit Policies for 1919;" H. W. Thorndike whose subject was "Co-Operation Between the Jobber and the Plumber." These were followed, in the afternoon, by a symposium on "Business Conditions from the Viewpoint of Directors and National Committeemen." The meeting voted unanimously for New York as the place for holding the June meeting.

W. E. Clow, of Chicago, has been named



DUPLEX CONE FAN
Belt Driven

HOWARD & MORSE

45 FULTON ST., N. Y.

Ventilating Engineers and Contractors

MANUFACTURERS OF

BLACKMAN and DUPLEX CONE FANS

which are installed by us complete with **Motors, Duct Work** and **Wiring**.

Aligning, Rigging and **Hoisting** done, with labor thoroughly qualified from long experience.

We make a specialty of **Kitchen Exhaust** work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations

The **Duplex Cone** Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The **Blackman** Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.

SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

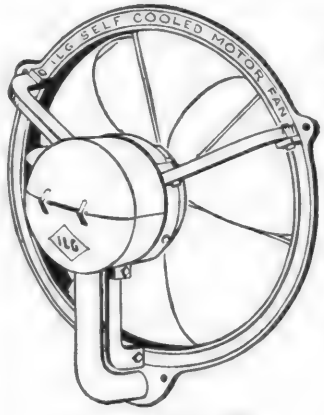
as the chairman for the committee representing the heating, ventilating and plumbing trades in Chicago district, for handling the new Victory Loan.

American Gas Association, Commercial Section, has appointed the following heating committee: George S. Barrows, chairman; W. W. Cummings, co-chairman; Thomson King, George E. Bennit, C. L. Bryant, J. J. Burns, Charles O. Frary, W. H. Taylor, R. Kidde, F. S. Wade, C. C. Winterstein, E. V. Daily, A .H. Humphreys, L. B. Newbert and E. J. Burke. One of the subjects the committee will take up is the question of gas companies taking on a heating load. An appropriation of $1,000 has been made by the association for laboratory purposes.

Lansing, Mich.—In a bill introduced in the Michigan House by Representative Herbert W. Gowdy, of Union Pier, it is provided that no heating system shall be installed or one displaced by another until the plans and specifications have been approved by the superintendent of public instruction. Teeth are put into the bill by the section which makes it a misdeameanor for any architect, builder, civil engineer, carpenter, mason, contractor, foreman or employee to make a single change without the approval of the superintendent.

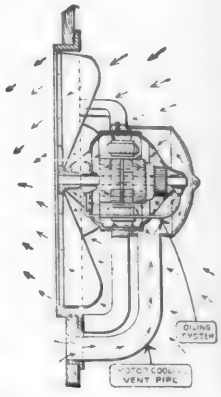
ILG FANS and BLOWERS

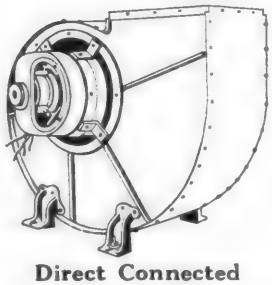
are extensively used by leading industries everywhere for heating and ventilating in their various phases



Sizes 12" to 72" Various Currents

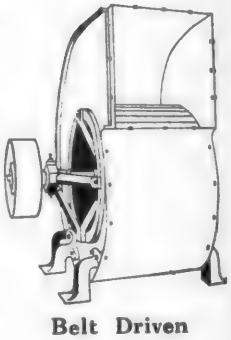
ILG "Self Cooled Motor" propeller fans operate most economically and with greater effect in extreme conditions and constant service. A stream of air through the patented "vent pipe" and enclosure keeps the motor cool and free from injurious effects of moistures, fumes, dust, etc.





Direct Connected

ILG Universal Blowers are compact and interchangeable. Easiest to install in cramped spaces. Reliable efficiency—low power consumption—quiet running.



Belt Driven

Pocket Manuals illustrating propeller fans, pressure and volume blowers, on request

ILG ELECTRIC VENTILATING CO.

158 Whiting St., Chicago, Ill.

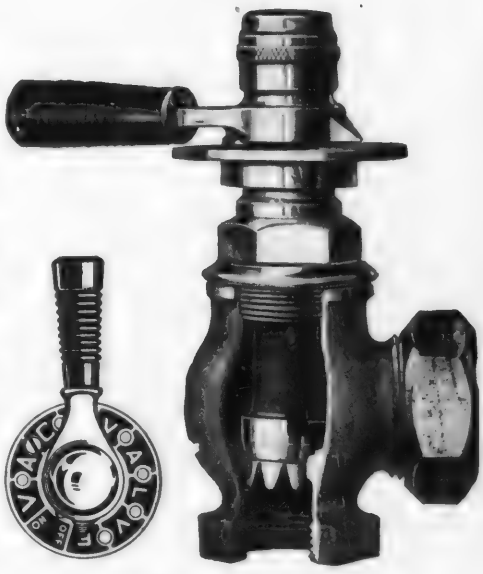
Branches in all large cities

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

DETROIT PACKLESS RADIATOR VALVES

The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.



DETROIT PACKLESS
Vacu Valve showing Dial Plate and Lever Handle

Booklet VP-1 Gladly Sent Upon Request

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO

LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

F. R. Still, vice-president and secretary of the American Blower Co., Detroit, and until recently president of the American Society of Heating and Ventilating Engineers, has left on an extended trip to the Far East where he will investigate trade conditions in connection with export business. Mr. Still's itinerary includes Japan, China, Australia and most of the European countries.. He expects to cover approximately 36,000 miles before returning home about November 1.

Manufacturers' Notes.

Atmospheric Conditioning Corporation, Philadelphia, Pa., is the new title adopted by the Braemer Air Conditioning Corporation. Under this title this company will manufacture and handle all Webster air washers, humidifiers, dehumidifiers and other air conditioning apparatus, including the Webster system of humidity control, which was formerly handled by the Braemer Air Conditioning Corporation. The offices will be maintained in the Lafayette Building, Philadelphia. The Atmospheric Conditioning Corporation, it is stated, is well organized to handle air washing for public buildings, generator coolers for cooling and cleansing the air used in the ventilation of turbo generators, as well as apparatus for automatically maintaining artificial atmospheric conditions in industrial plants. The officers of the corporation are: President, John F. Hale; vice-president, William J. Strandwitz; secretary and treasurer, Herbert A. Terrell; chief engineer, E. Nesdahl. Warren Webster, president and general manager of Warren Webster & Company, Camden, N. J., is a member of the board of directors. The territorial offices established in many of the larger cities of the United States and Canada and in London, will be continued.

Hoffman Specialty Co., New York, has prepared an attractive window transparency, for distribution among steam fitting contractors, featuring the Hoffman valves. This company is conducting an extensive advertising campaign in the popular magazines, as well as in the trade journals which is calculated to have an important effect in acquainting the general public with the merits of steam heating in general and the use of reliable venting valves and similar devices in particular.

John Simmons Co., New York, announces that it has recently enlarged its facilities for turning out all kinds of pipe bends, coils and general blacksmith work, as well

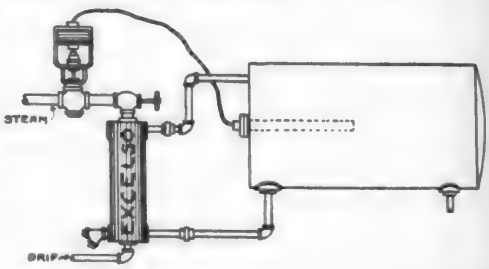
EXCELSO HEATERS FOR STORAGE TANKS

Large Heating Surface
Quick and Efficient

The Heater may be connected in many different ways to storage tanks and may be used with or without thermostatic control. It may also be used with or without the storage tank, either singly or in multiples with or without thermostatic control.

Sizes to fit all conditions

Send for new circular just out



EXCELSO SPECIALTY WORKS, Henkel Bldg., Buffalo, N. Y.

PIPE BENDING

MARINE EQUIPMENT AND REPAIR WORK
HEATING AND VENTILATING

THE OHIO HEATING AND PIPE BENDING CO.

Main Office and Factory, 1061-63 West 11th Street, Cleveland, Ohio

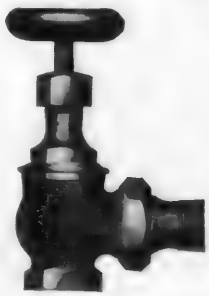
SOLE AGENTS FOR

F. J. Nice Oil and Combination Oil and Gas Burners

as oxy-acetylene welding. The company reports that activity in this line is increasing. A new pipe yard and building has been established by this corporation in Long Island City, the property comprising an entire block.

Westinghouse Elecetric & Mfg. Co., East Pittsburgh, Pa., announces the appointment of C. W. Johnson as assistant manager of works. Mr. Johnson has been in the employ of the Westinghouse company since 1907, having been previously with the Steel Motor Company, of Johnstown, Pa., and with the Bullock Electric Company, of Cincinnati. In 1904 he was made superintendent of Allis Chalmers Bullock, Ltd., of Montreal, when he entered the employ of the Westinghouse company he was made chief inspector of works, later being promoted to general superintendent, in which capacity he served until his recent appointment. He is a member of the A. S. M. E., A. I. Mining Engineers and of the Engineers' Society of Western Pennsylvania.

J. H. McLain Co., Canton, O., has appointed William R. Stockwell general manager of the company. Mr. Stockwell was for 23 years associated with the Lord & Burnham Company, of Irvington, N. Y., and until his new appointment held the



REG. U.S. PAT. OFF. TRADE JENKINS MARK Jenkins Bros

Satisfaction —in full measure

The unerring service of Jenkins Radiator Valves is assurance against complaints and "come-backs."

The dependability of Jenkins Valves is the result of superior construction. A much heavier and stronger steam metal is used, obviating trouble that frequently arises from expansion and contraction, lifting, or settling in the piping and other strains to which valves are subjected.

The Jenkins renewable composition disc give Jenkins Globe Valves extensive life and long service with the least care and attention.

The Jenkins "Diamond Mark" is the symbol of service—look for it on all valves for heating plant and plumbing use.

JENKINS BROS.

80 White Street, New York
524 Atlantic Avenue, Boston
133 N. Seventh Street, Philadelphia
300 West Lake Street, Chicago
Jenkins Bros., Limited
Montreal, London, E. C.

Jenkins Valves

And also through—

Asbestos

and its allied products

JOHNS-MANVILLE Serves the Conservation

Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Protection Products

Adjustment cost with this trap—is nothing

YOU can "take off" from a blueprint within 3% of your pipe runs. You can count the radiators from the plan but whoever guessed the labor item in cleaning up a job?

Adjusting traps comes under that head. A balky trap can eat up $s worth of time on every floor. A badly adjusted trap can spoil the architect's disposition.

You can't afford this and there's no reason for it if you'll use the Johns-Manville Radiator Trap.

Because there are no thermostatic parts or restricted air passages, no counter weights or regulating screws, there is nothing to get out of order. There are but three parts—a body, connecting union and a seamless hollow metal ball that floats freely on the water in the trap.

We'll send our special bulletin if you'll ask for it.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

JOHNS-MANVILLE Radiator Trap

position of manager of sales for that company. He will make his headquarters in Canton. His departure from the New York district, where he was well known, will be regretted by his many friends in the metropolitan section.

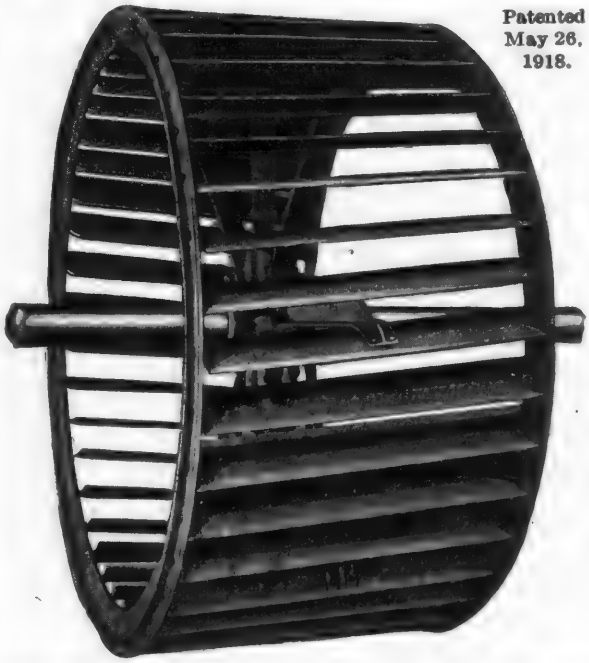
H. W. Johns-Manville Co., New York, has arranged to distribute to all of its salaried employees who have been in continuous service for the full calendar year of 1918, an extra compensation amounting to 20% of their salaries. This extra compensation, it is expected, will amount to $1,000,000. The company made a similar distribution at the end of each war-year, although the present high mark was only reached in 1917.

Jenkins Bros., New York, received a characteristic cablegram from Lieutenant William G. LeCompte, of its New York office, who has been "over there" with the 27th Division. The message, which was presented at the dinner of the company's sales force at the Hotel Astor, reads: "Regret absence Meilleurs sousaits pour assemblee et diner heureux arrivee bientot en reserver pour moi." The diners agreed with Lieutenant LeCompte in every particular. He has since returned to repeat his message in person and is receiving the congratulations of his wide circle of friends on his safe arrival and rugged appearance.

National Radiator Co., Johnstown, Pa., is planning to rebuild the portions of its works which were destroyed by fire early in February, with a loss of $15,000.

Pierce, Butler & Pierce Mfg. Corporation, Syracuse, N. Y., held a three-day convention of its sales force at its Eastwood plant, February 6, 7 and 8. Over 100 representatives were in attendance. There were also representatives of the Kellogg-Mackay Co., of Chicago, which is the western distributor of the Pierce line and representatives of the Forbes Taylor Co., Ltd., of Guelph, Ont., distributors of the Pierce products in Canada. These included C. V. Kellogg, president of the Kellogg-Mackay Company, accompanied by Vice-president Woodruff and Secretary Payne and J. W. Taylor and Mr. Fletto of the Taylor Forbes Company. The sessions were attended by various factory committees representing the 800 employees of the Eastwood plant. This practice is in line with the most advanced suggestions for the closer cooperation of employers and employees in industrial lines.

A Uniform Unrestricted Flow of Air



Patented May 26, 1918.

across the entire width of the whee means

Highest Efficiency

We do it by setting the vanes at an angle to the shaft (patented feature). Rigid and reinforced construction assures DURABILITY.

These features, coupled with "GARDEN CITY" SERVICE, should remind you of

Cycloidal Multivane

when you are interested in fans.

Catalogue containing complete data sent on request

Garden City Fan Co.

Est. 1879

CHICAGO, ILL.

Eastern Representatives:
L. J. WING MFG. CO., New York City

Sirocco"

TRADE MARK

Speeds Up Production

In these days of rush work, with everything strained to the limit, fresh pure air for the factory is of vital importance.

The Sirocco System of Heating and Ventilating is used by many of America's best known and most successful manufacturers.

The view above shows an installation in a factory noted for its production and efficiency methods.

In the "dog days" of summer the Sirocco System is invaluable in keeping the factory workers fresh and fit by supplying the proper amount of fresh, pure air to every nook and corner.

Let us tell you more about Sirocco for your factory—Ask for Bulletin No. 270.

American Blower Company

DETROIT, MICHIGAN

BRANCHES IN ALL PRINCIPAL CITIES

Westinghouse Canadian Company reports an order from the Hydro-Electric Power Commission of Ontario for two 45,000 kva. vertical water-wheel generators of 12,000 volts, three-phase, 25 cycles, for the commission's Queenstown development. These, it is stated, will be the largest water-wheel generators ever constructed and the order indicates that the commission thinks that there is no time like the present for construction work.

McAlear Mfg. Co., Chicago, Ill., manufacturer of the McAlear line of heating specialties, has removed its offices to its new location at 1901-7 South Western Avenue, Chicago.

Jas. P. Marsh & Co., Chicago, Ill., manufacturers of the Marsh line of air valves and other steam specialties, announce that James P. Marsh, who founded this business 54 years ago, now retires, disposing of his principal interest. Orville W. Thompson as president, and Robert A. Campbell as secretary, both identified for the past ten years in the active management of the company, will continue plans for the expansion of the business.

Central Station Heating Notes.

Springfield, Ill.—The Central Illinois Public Service Company has applied to the State public utilities commission for permission to discontinue its heating service in a number of central Illinois cities, including Virden, Charlestown and Carrollton. In the meantime the company has applied for an increase in its rates in those cities.

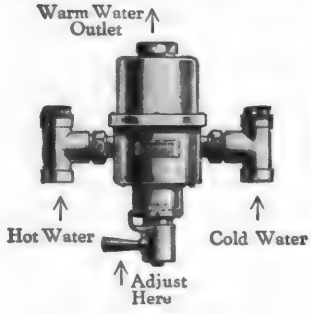
Springfield, Ill.—In the hearing on the application of the Springfield Gas & Electric Company to increase its rates in Springfield, the testimony of Professor J. D. Hoffman before the State public utilities commission endorsed the method of a fixed charge plus a meter rate as the most equitable to all parties concerned. This is the method which has already been put

GOLD'S THERMOSTATIC HEAT REGULATING SYSTEM

Operated entirely by ELECTRICITY.
Each room is a unit by itself.
Does not depend on an air compressor.
Requires no attention whatever.
Is free from all troubles which usually affect such devices.

GOLD CAR HEATING & LIGHTING CO.
17 Battery Pl. (Whitehall Bldg.) New York

TEMPERATURE CONTROLLING APPARATUS



For Shower Baths and Hot Water Lines

The Powers Thermostatic Water Controllers are true thermostatic mixers, not to be compared with the numerous mechanical mixers and so-called anti-scald valves on the market. Over-heated water cannot pass through a Powers Controller. If either hot or cold water fails, the entire flow is automatically cut off. Adjustment is simple and positive.

Never before in America's history has there been an opportunity offered the heating and ventilating engineer equal to that now afforded by the resumption of building operations, *coupled with America's new consciousness*—a realization of the virtue of *saving* and the evil of *waste*.

Automatic Heat Control is fundamentally *waste* prevention. It corrects the discrepancy between heat *supply* and heat *demand*, before it is manifest to the human senses, and thus stops the waste that results from over heating.

Automatic Heat Control also conduces to greater efficiency in the human machine—the most costly of all machines. These and other points relating to heat control are well worthy of consideration by the engineer, and we shall be glad to discuss them further with anyone interested.

Ask for Bulletin 124, giving full details of our extensive line of Automatic Thermostatic Temperature Regulators. Complete information sent on request.

Put any problem of Heat Control up to us. We'll give you the best we've got.

The Powers Regulator Co.
Specialists in Automatic Heat Control
954 Architects Bldg., New York. 2145 Mallers Bldg., Chicago
365 The Federal Street Bldg., Boston
The Powers Regulator Co. Ltd., Toronto, Ont.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Economy

Recirculated heat means a saving in the coal pile.

Buffalo Fan systems put heat mechanically just where it is wanted. They produce a slight plenum within the building which keeps the cold air out.

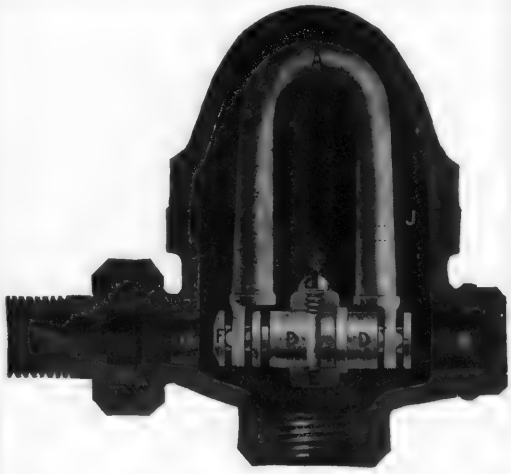
Buffalo Heating and Ventilating Apparatus

is no higher in first cost and their upkeep is offset by the saving in heat and the increased efficiency of the workers.

Write for catalog 198-36. It gives valuable engineering data in heating and ventilating problems.

BUFFALO FORGE COMPANY, Buffalo, N. Y.

New York Boston Philadelphia Pittsburgh Cleveland
Chicago Los Angeles



HAINES VENTO TRAP
Recommended for use with cast iron radiation with low pressure steam.
Not exceeding 10 lbs.

ALL Haines Automatic Valves and Traps are guaranteed absolutely for a period of five years, when used on vacuum or low-pressure heating systems.

These valves were built right in the first place. That's why it has not been necessary to change the principle of their thermostatic tube as originally designed.

Send for latest catalogue

WM. S. HAINES & CO.
Philadelphia, Pa.

into effect by the commission. Professor Hoffman testified that his investigation showed him that the findings of Engineer Bennett and his division of property values and operating expenses between the electrical and heating plants had been fairly and equitably made. The case was taken under advisement by the commission.

New Incorporations.

General Heating Co., New York, capital $1,000,000, to install heating, lighting and ventilating plants. Incorporators: W. V. Kelly, Frank T. Sargent, of New York; and Albert E. Mayes of New Rochelle, N. Y.

Mountain Biloop Radiator Co., Lancaster, Pa., capital $2,500,000 to manufacture boilers, radiators, etc. Incorporators: V. B. Stauffer, J. B. Stauffer, V. B. Vaux and Clayton S. Billinger, all of Lancaster.

Better Heat Service Corporation, Adams, N. Y., capital $55,000, to manufacture boilers, heaters, furnaces, coal-saving devices, etc. Directors: William S. Rice, Adams; Elizabeth M. Rieth, Albany; and Charles P. Cronin, Troy.

Mason Specialty Co., Cambridge, Mass., capital $99,000, to manufacture heating appliances. President, W. Kennedy, Boston; treasurer, Joseph E. Vincent, 10 Kenwood St., Cambridge; clerk, Jeannette M. Mason.

New Firms and Business Changes.

Munier & Wolff, Inc., engineers and contractors, New York, is the title of a new firm composed of Leon L. Munier, M. E., formerly with Henry C. Meyer, Jr., consulting engineer, and Richard A. Wolff, M. E., formerly with Walker & Chambers, engineers and contractors. The new firm has opened offices in the Long Beach Building, 405 Lexington Avenue, New York, and will specialize in heating, ventilating and steam power plant installations.

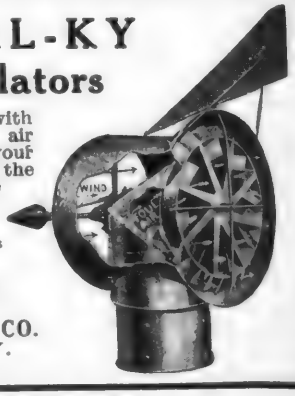
BI-CAL-KY Ventilators

No power bills with this fan. The air that passes over your building furnishes the power to ventilate it.

We Guarantee Results

Write for information

BICALKY FAN CO.
Buffalo, N. Y.



✢ SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE ✢

DEAD METAL

IS NOT what you get when you invest in any of the Sturtevant products. Sixty years of live, energetic, scientific Engineering experience have changed this cold medium to the most efficient line of

Fans - Blowers - Engines - Turbines - Power Plant Fquipment

possible to produce.

Sturtevant has always meant **QUALITY** and no one has ever disputed this, because of our Scientific methods of manufacture.

Our results have been assured by the retaining of the Finest Engineering Staff we could find. These men analyze every application of Sturtevant apparatus and their recommendations are given, not by guess, or rule-of-thumb, but by exactitude from scientific knowledge. You are not asked to gamble but to invest in results.

In harmony with Sturtevant progressiveness, we have now added a

SERVICE DEPARTMENT.

This assures satisfaction to you from the placing of your order to the actual operation of your machine. This department will adjust any dissatisfaction

REGARDLESS OF THE CAUSE.

This is your

INSURANCE against DISSATISFACTION.

For your convenience and protection, we have Branch Offices, with Sturtevant Engineers, in all principal cities.

B. F. STURTEVANT COMPANY,
BOSTON, MASS., U. S. A.

SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE

SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE

✢ SPECIFY STURTEVANT SERVICE - SPECIFY STURTEVANT SERVICE ✢

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Show Me!

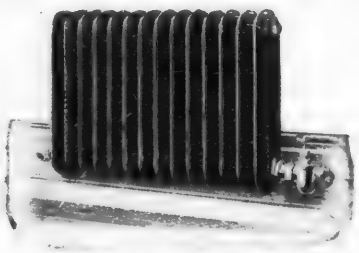
We can't fool 'em—the people. It costs too much to unfool 'em. Specify something that doesn't make good and see who does their work next time. It's a question of "show me" on every count after that. Same in your case. If you don't *know* the worth of

Pressweld Radiation

we want to *show you.* We want you to realize that *Pressweld* is a time, fuel, space and money saver. We want you to find out how quickly and easily it can be handled and installed—what perfect radiation it gives. When you know these things you'll understand *why it pays* to specify *Pressweld.* But you'll never know unless you permit us to show you. Will you? Say the word and we will explain at once. It means *more* money in *your* pocket.

"Modern Heating" is chuck full of interesting facts on heating and ventilation. Get your copy now. Address Dept. "D".

American Pressweld Radiator Cerporation
DETROIT, MICHIGAN



Sumner & Gerald, jobbers of heating and plumbing supplies, Boston, Mass., have dissolved patnership and a new partnership has been organized composed of Frank D. Sumner of the old firm and Howard R. Dunbar. The new firm will do business as Sumner & Dunbar.

Brunelle Heating Co., Worcester, Mass., has been organized to take over the business of F. X. Brunelle. Offices have been opened at 17 Heywood Street, Worcester. The business will be enlarged to cover the general field of heating engineering and contracting. Those interested in the concern include Adrian Van Leeuwen of the Horticultural Co., Worcester, and Stephen M. Degnan, who becomes general manager.

Pending Legislation on Boiler Inspection.

Pending legislation in various states, affecting the construction, installation and inspection of stationary boilers is brought to the attention of members of the Heating and Piping Contractors' National Association, through its *Official Bulletin* for March.

In Michigan, for instance, House Bill No. 93 provides for the licensing and regulation of all persons installing heating and ventilating apparatus as follows:

"No person, firm or corporation shall design, install, construct or use any apparatus covered by the provisions of this act without first obtaining a license from the State Board of Boiler Rules and otherwise complying with the provisions of this act and the rules and regulations formulated under this act. The license fee required under this act shall not exceed ten dollars per annum."

This bill, it is stated, aso provides for a fine of not more than $100 or imprisonment for not more than one year, or both, for a violation of the act.

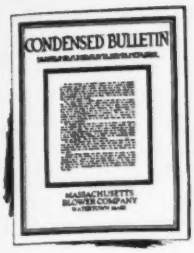
In Minnesota House Bill No. 337 provides for an annual State inspection of all steam boilers and heaters, at a cost of $3.00 per

RIC-WIL Paint for Heated Surfaces

A brilliant black paint of superior preservative properties, dries hard yet is tough and elastic. It has a bond with clean metal that preserves its adhesion during contraction, expansion and bending.

Lasts Much Longer than the Average Coating.
Especially Good for Underground Heating Pipes.
Let us send You a Free Sample to Test.

THE RIC-WIL COMPANY, Cleveland, O.

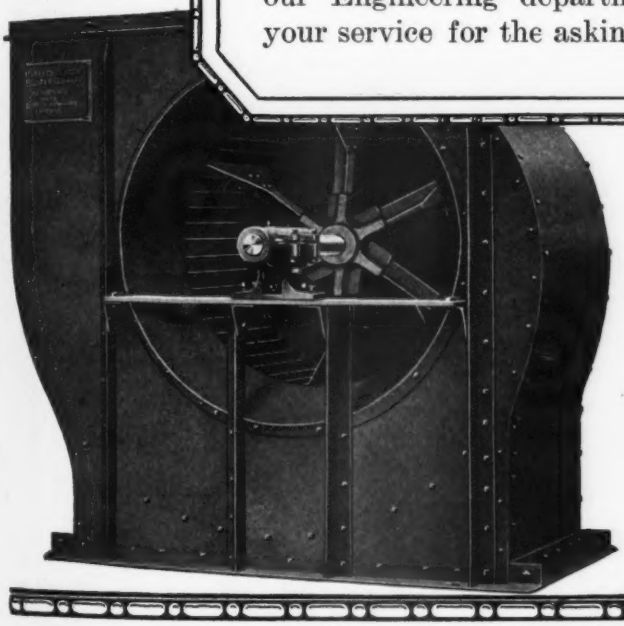


Write for copy—sent for the asking

THE MASSACHUSETTS SQUIRREL CAGE FAN with its saving in space and weight has been the solution of many an engineer's ventilating problem.

Our Bulletin 51 presents in a condensed form the capacities, weights and sizes of our Fans, Blowers, Heaters, and Air Washers for Heating, Ventilating, Purifying, Cooling, Humidifying, Dehumidifying, Forced and Induced Draft and Commercial Drying.

The statistics and data compiled by our Engineering department are at your service for the asking.



MASSACHUSETTS BLOWER COMPANY

WATERTOWN, MASS.

BOSTON CHICAGO NEW YORK
and
Branches in twenty principal cities throughout the country

100-4

inspection, making only the following exception:

"The provisions of this act shall not apply to heating plants in buildings occupied solely for residence purposes, with accommodations therein for not more than four families."

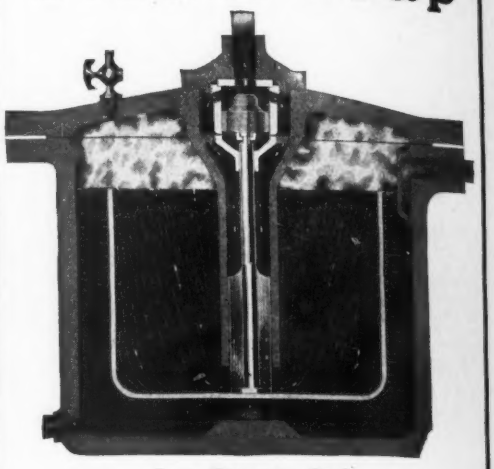
It would seem from this that all heating plants in buildings used for residence purposes only are exempt, and that all heating apartments, housing more than four families, must be inspected, as well as all heating boilers in office buildings, hotels, etc.

In Oregon a bill has been introduced in the house (No. 249) "to provide for the safety of operation of steam boilers by requiring the inspection thereof." It reads:

"All steam boilers operated under more than 15 lbs. pressure shall be thoroughly inspected internally and externally at intervals or not more than one year, except boilers in private residences, public buildings and in apartment houses used solely for heating and carrying pressures not exceeding 15 lbs. and having less than 4 ft. of grate surface; boilers of not more than 3 H. P. are also excepted. The owner or user of a boiler herein required to be inspected shall pay to the inspector upon inspection $7.00 for each boiler internally and externally inspected, and $3.00 for each boiler inspected while in operation."

The comment on this bill is that if a

VANCE
Steam Trap

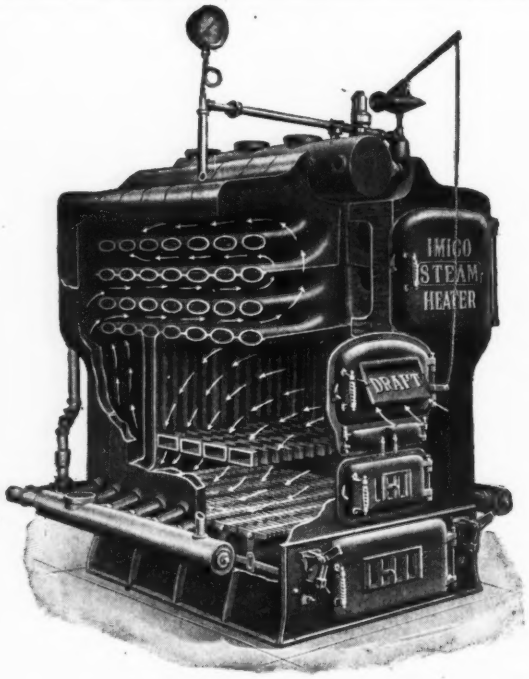


Low Pressure Style

Extra Large Discharge Valve

No Small Parts to Corrode and Stick

VANCE-VETTER CO., Pittsburgh, Pa.



IMICO
Heating Boilers

Smokeless

DOWN DRAFT

For Water or Steam

Our Catalogue describing our complete line of Heating Apparatus sent on request

ILLINOIS MALLEABLE IRON CO., Chicago

BUCKEYE FANS

are correctly designed for every duty:

Mechanical Ventilating Work; **Mine Ventilation;**
Dry Kiln Work; **Forced or Induced Draft Work;**

Waste Heat Installations of all Kinds;

Any Mechanical System where Space is Limited.

BUCKEYE FANS deliver large volumes of air with maximum efficiency and lowest power consumption.

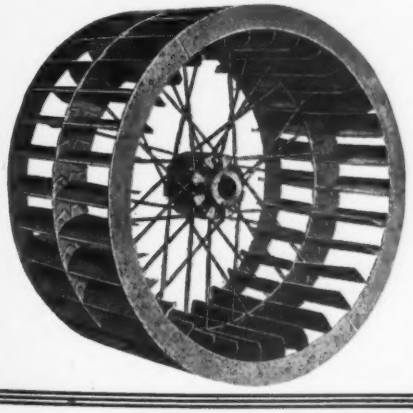
BUCKEYE FANS are of heavy construction, finished in a neat and workmanlike manner and are noiseless in running.

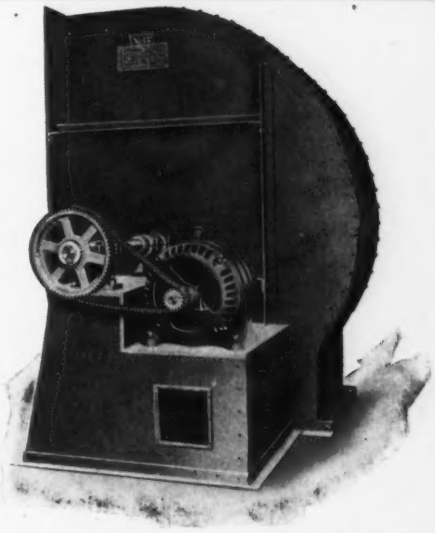
Write us now

Buckeye Blower Company
COLUMBUS, OHIO

The Fan and the Wheel
PLEXIFORM

Maximum air delivery against low or medium-high resistance from a minimum of housing
Highest obtainable mechanical efficiency
Strength
Lightness
Quietness in operation





A method of construction equally adaptable to high as to low pressures and as practicable for double-width as for single-width fans.

Our Bulletin 17-V is a handbook on fan design
Sent on request

BAYLEY MFG. CO., Milwaukee, Wis.

boiler is properly designed there would be nothing to inspect upon installation and if the pressure of 15 lbs. is not exceeded there would be no need for an inspection when the boiler is in operation.

In Montana a bill has been introduced in the Senate (No. 32) providing for an annual inspection of all boilers, excepting those used for heating purposes in private residences, at a cost of $5.00 in incorporated cities and $10.00 elsewhere. It is urged that steps should be taken immediately to change the wording of this bill so that all boilers carrying a pressure of 15 lbs. or less will be exempt from inspection, whether located in private residences or elsewhere.

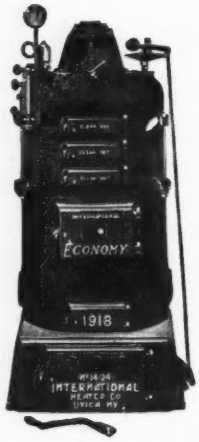
In Kansas the object of House Bill No. 224 is to provide for the inspection of steam boilers, exempting, however, boilers carrying less than 15 lbs. of pressure. It is suggested that this bill be changed to read "except boilers used for heating purposes, carrying a pressure of 15 lbs. or less." It is pointed out that the line of demarcation between a low-pressure and a high-pressure boiler is defined by the A. S. M. E. Boiler Code as 15 lbs. and under the exemption clause as it stands in this bill, a boiler carrying exactly 15 lbs. pressure would be subject to inspection.

In New York (Assembly Bill No. 257) the provisions are similar to those of the Kansas bill.

WANTED.

Position Wanted.—Heating engineer experienced in heating, ventilating and power work. Acquainted with New York State trade and architects. Seventeen years with two firms and at present connected with the Construction Division of the War Department, at Washington, D. C., as heating and ventilating engineer. Position wanted as traveling or special representative for boiler heating or plumbing goods manufacturer. Address Rider, care of Heating and Ventilating Magazine.

Position Wanted as mechanical engineer. Have a far-reaching experience in heating, ventilating, power house installations, etc., and in these lines have served a number of years as estimator and superintendent for several reliable firms. Address, L. R., care of Heating and Ventilating Magazine.



ROUND BOILERS

21 sizes
Capacities
350 to 1475 sq. ft.
direct steam radiation

INTERNATIONAL

ECONOMY BOILERS

High evaporative power and large coal carrying capacity allow us to put conservative ratings on these boilers for 8, 10 and 12 hour firing periods.

This means ECONOMY of fuel and economy of attention—two features that mean satisfied customers.

Catalogue 1296-H tells the complete story
Send for it

SECTIONAL BOILERS

27 sizes
Capacities 700 to 4700 sq. ft.
direct steam radiation

INTERNATIONAL HEATER CO.
UTICA, N. Y.

BRANCHES: NEW YORK CHICAGO NASHUA, N. H.